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New Expeditious Method of Baking Cores

Under-Floor Firing Pits with Pits
Under Air Pressure—Rack - Type
Ovens Employed to Reduce Handling

THE automobile business, it is believed, has been responsible for many advances in foundry practice. With the advent of the automobile came a demand for absolute accuracy in castings and for a homogeneous metal which would give tight cylinders, jackets, etc., and further a metal which would not crack when subjected to repeated shocks. This article is confined to certain phases of the core problem.

In the larger automobile casting foundries many intricate cores have to be handled every day. After

Pontiac, Mich., which is making the entire output of gray-iron castings required by the mammoth plant of the Willys-Overland Company at Toledo, Ohio. The object, of course, was to produce the greatest possible output of cores in the smallest possible floor space.

The majority of the cores in this foundry are baked in what are known as rack-type ovens, designed and built by the H. M. Lane Company, Detroit, Mich. In Fig. 1 three double batteries of these ovens are shown. There are ten ovens in each

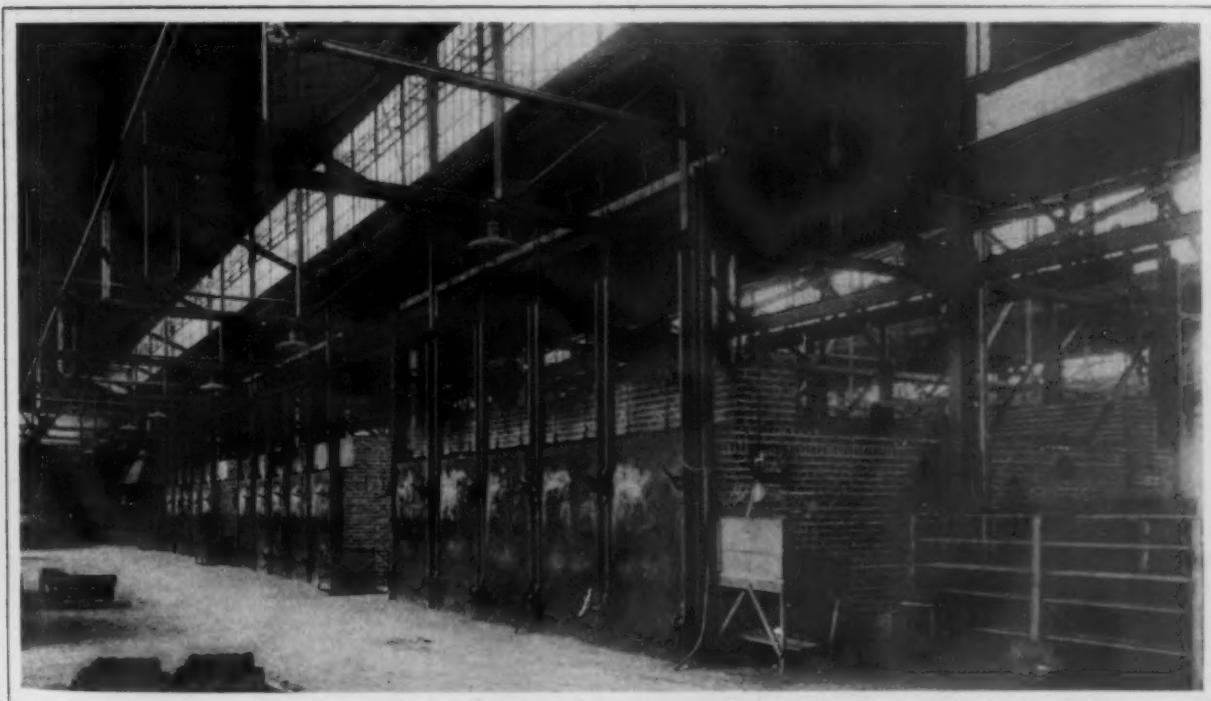


Fig. 1—Three Batteries of Forced-Draft-Fired Rack-Type Core Ovens

these cores are made and baked they have to be assembled and pasted together and then rebaked to dry the paste. In some cases part or all of the mold is made of dry sand in the form of a core, and these rammed-up cores increase the work in the core department. The tonnage of sand handled in a large plant, both in bulk and as cores, introduces serious handling problems, and in order to facilitate this work it is necessary to reduce labor to the greatest possible extent.

With these points in mind, a new core room has recently been laid out and put into service at the plant of the Wilson Foundry & Machine Company,

battery, arranged in two groups of five each placed back to back. In Fig. 2 an interior view of one of the ovens is shown with one of the racks in place, and in Fig. 3 the electric-lift truck is shown introducing the second rack into the oven. Each oven is made of sufficient size to accommodate two racks. In practice these racks are set down next to the core maker's bench, and the core maker puts the green cores upon the rack. The truck then picks up the rack and places it in the oven, where the cores are baked. After baking, the racks of hot cores are withdrawn and set on the cooling floor, and other racks are substituted for them. The

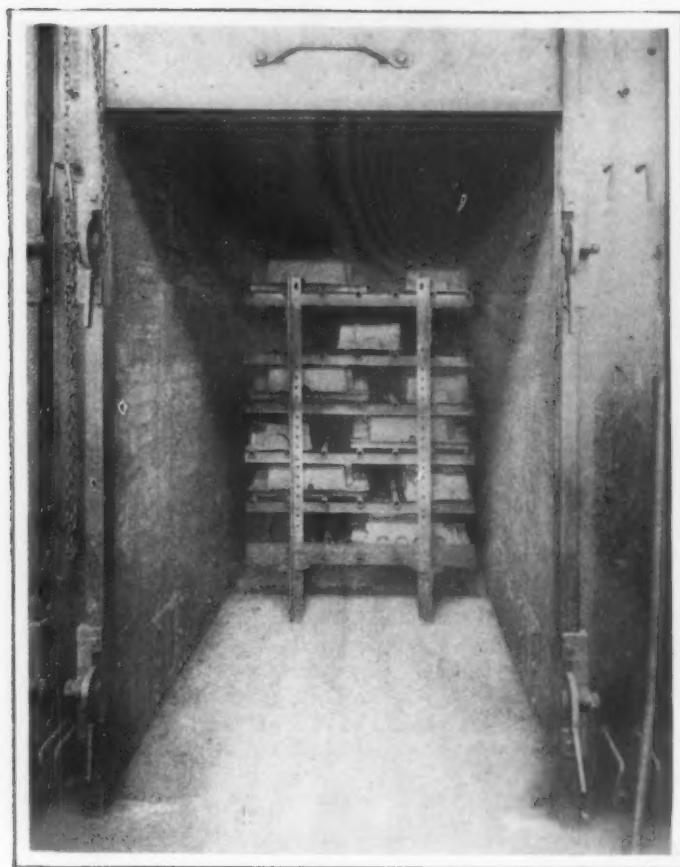


Fig. 2—Rack-Type Oven with First Rack in Place, Ready to Receive Second Rack

ovens are always kept closed whether empty or full, to conserve heat, the doors being opened only at the time cores are being placed in or removed from the oven.

The ovens are of the forced-draft type, and are arranged with auxiliary air in accordance with the Lane patent methods. In this case the fire boxes are all sunk beneath the regular foundry floor, and the firing pits are entered through ladderways which may be seen in Fig. 1, to the left of each battery of ovens. The entire fire pit is under air pressure, and dampers are provided for controlling both the forced draft in the fire pit and the auxiliary air used to temper the products of combustion to the desired volume and temperature. The doors are insulated with cellular insulating material, are counter balanced, and provided with locking cams, which hold them in place when closed. In these ovens the heat enters at the back, and is taken out through dampers at the front.

Some of the ad-

vantages claimed for having the fire box below the floor are: The only interference with regular foundry operations arises from the fact that there must be a manhole through which coke can be dumped into the coke bin and a ladderway for reaching the pit; all the rest of the foundry space is available. Ovens of this type have been in use for more than two years, and have proved their success.

Fig. 6 shows a group of core racks, and also a hand-lift truck which is used for shifting racks from place to place when the electric lift truck is not immediately available. In this view the electric truck is also shown in the act of backing under one of the racks. The Lane Company, it is understood, has patent applications in covering various features in connection with the racks and their use for drying cores. The racks are also arranged so they can be picked up by a trolley and taken to the foundry as required.

Practically all of the storage of cores in the Wilson Foundry is on racks. This system has been found to be more flexible than the installation of permanent shelving and also does away with the handling of cores. The core is placed in position by the core maker and is not removed until it is to be inspected and sent to the foundry, or until it is required by the man pasting up groups of cores.

In this plant there are also two batteries of drawer-type ovens. These were installed by the H. M. Lane Company, and one of them is shown in Fig. 5. This is an all-metal type of oven. The battery shown in the illustration was used in the old plant for more than a year before it was removed to its present location. Behind this battery there is also a battery of brick ovens of the drawer type, a corner of which is shown in Fig. 4. The lifting mechanism shown is interesting on account of the fact that it is a return to a simple type. In all of these ovens the outlet dampers are controlled by rods which extend to the front of the ovens. This places the entire control

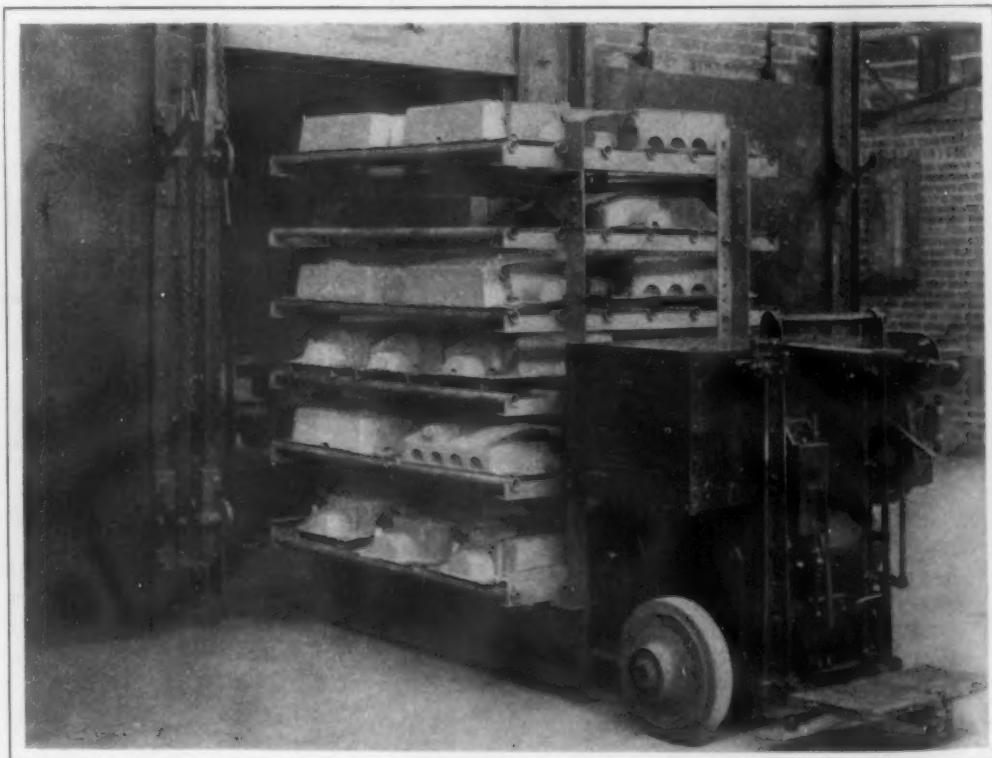


Fig. 3—Electric Lift Truck Introducing Second Rack Into the Oven

of the ovens immediately under the operator's eye.

Some years ago the time dials, shown on the front of these ovens, and particularly plainly in Fig. 4, were adopted. When used in connection with drawer ovens, where there is an attendant constantly in front of the drawers, these time dials have been found very successful. When used in connection with the rack-type ovens, where one man has charge of the baking in 30 ovens, it has been found impossible to depend on the time dials, on account of the fact that when no one is looking some of the foreign labor are likely to move the pointer, just to see what will happen if they do it, and thus destroy the record. For this reason the man in charge of the rack-type ovens has gone back to the old-fashioned piece of chalk to record baking time.

The oven with forced draft and auxiliary air supply has been found more satisfactory in giving uniform drying, Mr. Lane says, than can be obtained from direct-fired natural-draft ovens. One fact, he emphasizes, must not be lost sight of, and that is that an oven is a machine doing work. The work may be divided into two parts. First, there is a large amount of water to be evaporated and carried out; and second, there is a certain amount of binder to be baked and hardened. The moisture must travel through the oven from the point where the heat strikes the first cores to the outlet, and as a consequence the cores that are nearest to the outlet must have all of the moisture from the other cores swept past them. The result is that in an oven where the products of combustion are taken out at the bottom the moisture will naturally drop toward the bottom and cause slower baking in the lower part of the oven. With forced draft and auxiliary air, the incoming heat can be tempered so that it will not injure the cores in the top of the oven, and the rapid circulation gives quick drying in the points nearest the outlet.



Fig. 4—Lane Drawer Ovens, with Drawer-Lifting Mechanism and Rods for Controlling Dampers

Care of Crucibles

Finding the proper clays, as well as the securing of such materials in sufficient quantities, is what has troubled the crucible maker. This, in fact, is the rock on which their hopes and efforts have been wrecked. But at last the sky is clearing, says a prominent crucible manufacturer. Clays of more satisfactory sorts have been secured, and with their use better results

in the foundry will be had and longer lived crucibles will result. It rests, however, with the user, in a measure to improve the present unfortunate state of affairs, and this can be done in the following ways:

Greater care must be given in annealing; more time must be consumed, after the crucible is received, before it is put into service; and smaller crucibles must be used than those which the foundry has been in the habit of using. In the past all brass rollers, crucible steel makers and jobbing shops thought nothing of having six months or a year's stock of crucibles ahead of their wants—seasoning and drying. But now the new crucible is put into immediate use.

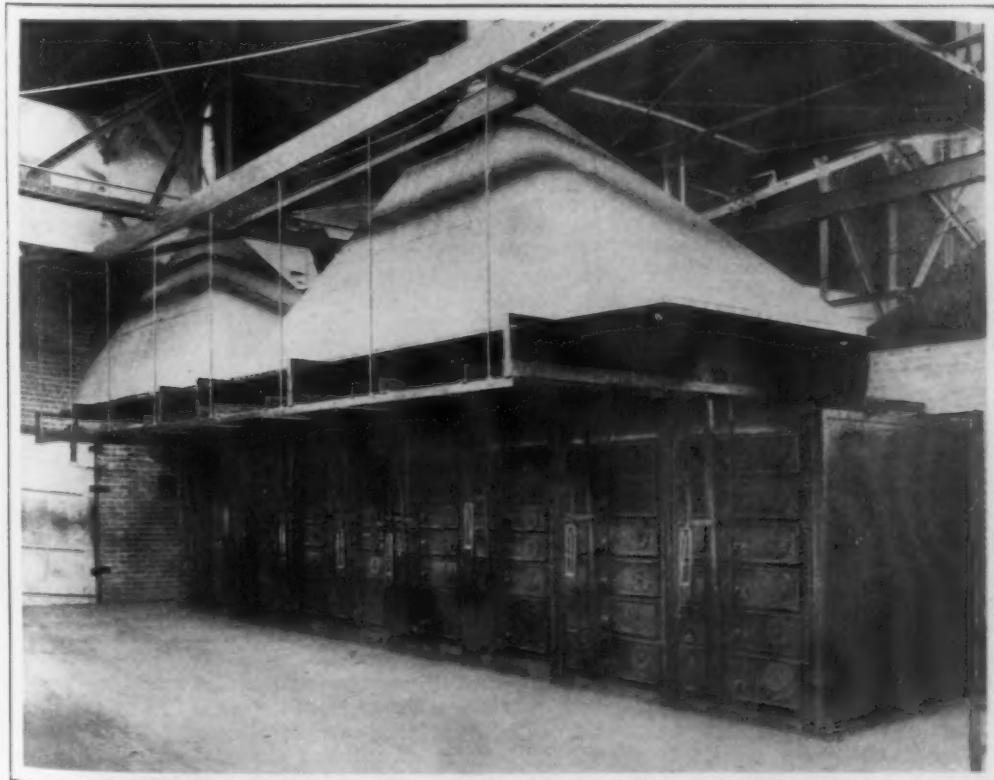


Fig. 5.—Eight All-metal Drawer Type Ovens. Fired under Forced Draft



Fig. 6—Racks with Cores in Storage, Showing Hand Truck and Electric Lift Truck

The native clays now being put to use have made the crucible more frail and tender than were those made from foreign clays, more likely to crack on sudden heating or cooling. Therefore, more than ordinary care must be used by the melters in the handling of American clay-made crucibles. They should not be cooled down too rapidly, nor should the heating up be done too quickly. It is a good plan to return the crucible while it is still hot, after the day's work is done, to the furnace, from which, of course, the coal has been dumped. By doing this the strain in the cooling will not be so severe and the crucible will not crack so early in its life. The smaller the crucible is the greater are the number of heats that can be secured. Therefore, if a crucible of a size or two smaller than what is generally used is adopted, better values and less disappointments will be the result. For instance, if a foundry has been using a 400-lb. pot, let it adopt a 300 or a 225-lb. pot, or in a shop where 60 lb. is the rule, let it be a 45 or a 50-lb. In this way, both caster and crucible maker will be relieved of the hundreds of annoyances and complaints that for the last few months have made their bed anything but one of roses.

New Koppers Coke-Oven Contracts

The H. Koppers Company, First National Bank Building, Pittsburgh, has recently received contracts for the building of 640 by-product cross regenerative coke ovens of 12½ tons coal capacity for the Carnegie Steel Company at Clairton, Pa. This plant will be built in 10 blocks of 64 ovens each, and it is intended later to add a similar plant of 640 ovens. The output will be about 7500 tons of coke per day, which will come close to supplying coke for the Carnegie Company's seven Carrie furnaces, three Clairton furnaces and six Duquesne stacks. These ovens will also furnish about 85,000,000 cu. ft. of surplus gas per day, which will be used in the company's mills at Duquesne, Clairton and Homestead. The Koppers Company has also received an order from the National Tube Company for 208 by-product ovens at Lorain, Ohio, to be built in four blocks of 52 ovens each. They will turn out about 2200 tons of coke per day, or nearly enough to serve the blast furnaces at Lorain, and also about 22,000,000 cu. ft. of surplus gas per day, which will be used in the steel plant. The Koppers Company has also an order from the American Steel & Wire Company for 180 Koppers by-product ovens to be built at Cleveland, Ohio, in four batteries of 45 ovens each. These ovens will turn out about 2000 tons of coke per day, to be used by the

blast furnaces, and also about 20,000,000 cu. ft. of surplus gas per day, which will be used in the company's local mills. The erection of the ovens at Clairton, Cleveland and Lorain was started some time ago, but the contracts with the Koppers Company were not signed until recently.

The Colorado Fuel & Iron Company, Pueblo, Col., has placed a contract with the Koppers Company for 120 by-product coke ovens, consisting of two batteries of 60 ovens each. They will turn out about 1350 tons of coke per day and 12,000,000 cu. ft. of surplus gas.

The Koppers Company has completed for the Toledo Furnace Company, Toledo, Ohio, 94 by-product coke ovens, built in two blocks of 47 each. Contract for these ovens was signed June 1, 1915, and they were completed May 1, 1916, or in 11 months, this being the quickest by-product coke-oven construction ever done in America. They will hold 12½ tons of coal per charge, and will turn out about 1100 tons of coke and about 11,000,000 cu. ft. of surplus gas per day.

The Camden Coke Company, Camden, N. J., through the Public Service Corporation of New Jersey, has started work on a benzol plant being erected by the Koppers Company, and work has also been started on a Koppers by-product coke-oven plant for the Seaboard By-Product Coke Oven Company, to be built on the Jersey Meadows, near Jersey City. These ovens will turn out about 11,000 tons of coke per day and also 11,000,000 cu. ft. of surplus gas, the coke and gas having been sold for a period of 25 years to the Public Service Corporation of New Jersey, the gas to be used for domestic lighting and heating.

The new plant of 204 Koppers by-product coke ovens under erection for some months for the Youngstown Sheet & Tube Company, Youngstown, Ohio, is nearly completed, and is expected to be ready for making coke about July 1, or shortly after. It will turn out about 2000 tons of coke per day, and close to 25,000,000 cu. ft. of surplus gas, which will be used by the company in its steel works and finishing mills at East Youngstown.

Foreign Specifications for Railroad Material

Specifications for railroad material—rails, axles, wheels and tires—used in several European countries are given in full, together with a digest and discussion, in Technological Paper No. 61, just issued by the U. S. Bureau of Standards in connection with its investigation of failures of railroad material. Available data concerning the types and weights of foreign railroad equipment, together with those concerning derailments and accidents abroad, are included.

Water Intake Screens for Mill Power Plant

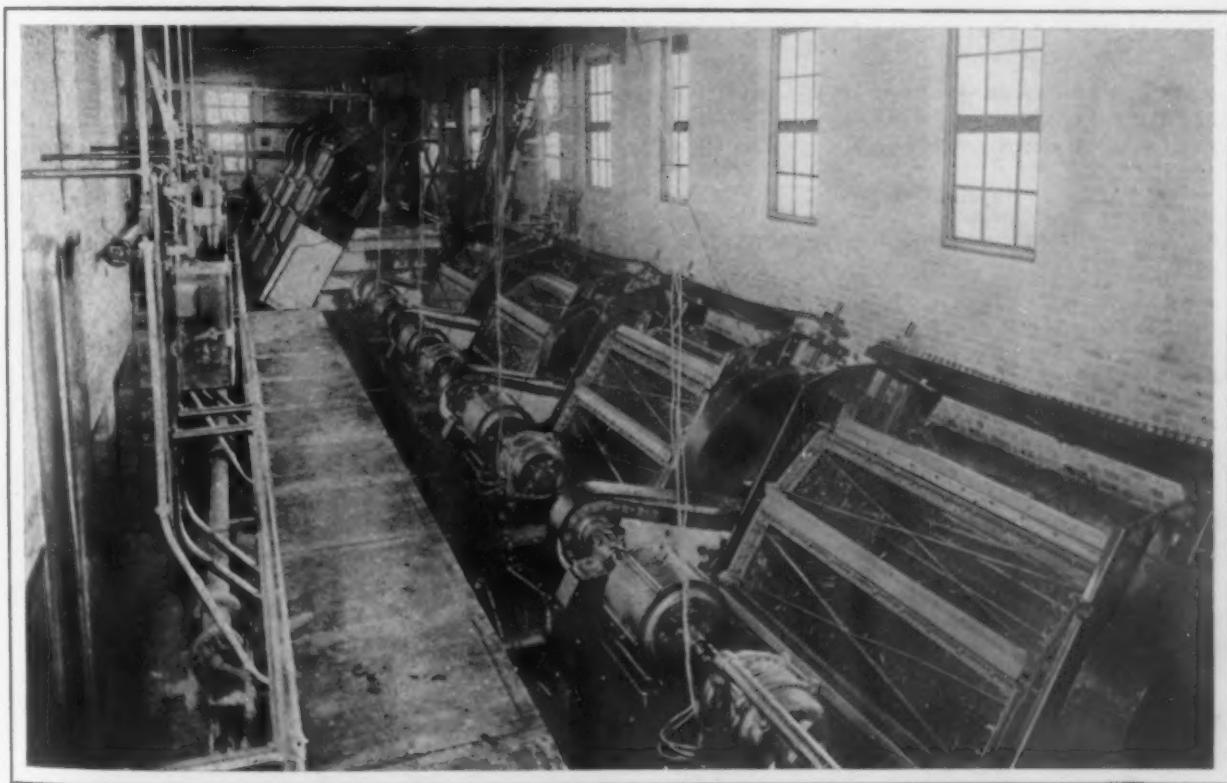
The Chain Belt Company Installs a Traveling Type of Self-Cleaning Device at Cleveland for Removing Debris and Floating Material

AS a part of the construction of its steel plant and two additional blast furnaces, Corrigan, McKinney & Co., Cleveland, Ohio, are installing in the pumping station which will supply all of the water to the power house for their mills and furnaces two traveling self-cleaning intake water screens. The screens were built by the Chain Belt Company, Milwaukee, Wis., and are of a type originally designed for installation at the Northwest Power Station of the Commonwealth Edison Company, Chicago, and since duplicated in other power stations in Chicago, Detroit and Milwaukee. A view of the Commonwealth Edison Company installation is shown in one of the accompanying illustrations, while a single screen unit is shown in the smaller cut. At the Corrigan-McKinney plant the pump for which the water is screened will handle 50,000 gal. per minute, drawn from the Cuyahoga River, water carrying solids that would necessitate frequent removal of stationary screens for cleaning, and of a character likely to be ruinous to boilers and condensers unless thoroughly screened.

It is the necessity of cleaning the screens which reveals the limitations of the commonly used stationary type. While the placing of two, and fre-

detriment of the power plant equipment. The labor cost of changing screens where dirty water is handled also runs up in a manner to render the low installation cost of stationary screens much less impressive.

These screens are built in units as indicated. The machines consist essentially of wire screening baskets, 5 ft. 3 in. x 1 ft. 5 $\frac{1}{4}$ in., and made of No. 12 copper wire meshed at $\frac{5}{8}$ -in. centers, mounted on two strands of steel chain belt of 18-in. pitch. The baskets are stiffened with a galvanized steel frame bolted together with sherardized bolts. These chain belts and screens form a continuous screening apron which passes over 36-in. semi-steel sprocket wheels at top and bottom, the sprockets being carried on 3-in. cold rolled shafts mounted in a structural steel supporting frame. There are lips on the baskets, and as this screening apron moves through the water slowly and in an upward direction it carries with it particles screened from the water. After turning over the head sprockets these particles are deposited in a trough from which they are flushed into the river on the down stream side. The cleaning of the screen baskets after they pass over the head sprockets is effected by having a spray pipe running back of the screen baskets which en-



Traveling Self-Cleaning Screens Which Remove Floating Matter and Debris from the Water Supply to the Power Station of the Commonwealth Edison Company, Chicago

quently three, stationary screens in series in an intake makes it possible to remove them for cleaning, one at a time, without stopping the pumps, yet it is the common experience that the removal of the screens results in the dislodging of some of the accumulated solid material which, particularly in the case of the last screen, is then carried by to the

ables a continuous spray of water to pass through the screens from the back to the front, thus carrying away the particles which would naturally adhere to the screens.

Each unit is driven by a 5-hp. motor from the head end with a chain and sprocket wheel drive. In the majority of installations these screens have been



One of the Traveling Water Screening Units Built by the Chain Belt Company

placed on an incline, as shown on the cut, but there are several units which have been built in a vertical position and which are found to operate with satisfaction.

Plaster of Paris for Patterns

Discussing plaster of Paris for patterns, J. R. Moorhouse, in a paper before the Lancashire branch of the British Foundrymen's Association, referred to the use of this material in place of wood. The author showed how a worm pattern could be turned out in plaster by a lathe in a very short time and also how the teeth of the worm wheel could be cast in plaster so as to be truer than when made in wood. He pointed out how, when the drawings come to the pattern-maker from the drawing room, immediate pressure is put upon the pattern shop to give quick results which is often impossible with wooden patterns, some of which mean two, three or even five days' work. He admitted that for certain classes of work wood is still the only material, but there are many occasions when plaster could be used, saving both time and cost of material.

The use of plaster is not new, but many still deny its advantages. Mr. Moorhouse advised great care in ascertaining the exact character of the plaster by mixing samples and noting the characteristics and the time required for setting. Many disappointments result in its use because of ignorance in this respect. Some experience also is needed in manipulating, especially on strickle work, for when once the plaster begins to set it can not be dealt with except at the risk of impairing the strength of the pattern. Temperature of the room has something to do with the matter, but as a rule it is right to sprinkle the plaster lightly and quickly over the surface of the water until it begins to settle. Then the plaster and water should be mixed thoroughly with the hand until they are of the consistency of cream. For strickle work the first coat has to be a trifle thicker and the finishing coat thin.

STEEL IN WROUGHT-IRON PIPE

A New and Quick Etching Test for Its Detection

An etching test has been developed by the A. M. Byers Company, Pittsburgh, manufacturer of wrought-iron pipe, as an aid in detecting the presence of steel in pipe sold as wrought iron. While this test may be used in detecting steel in any of the commercial shapes of wrought iron, it is particularly suitable for the investigation of pipe.

The detection of steel by means of etching with picric acid and a microscopic examination requires the preparation of a metallographic specimen and is a tedious operation involving considerable time and the exercise of great care. Even when the wrought iron contains a large percentage of steel the steel contents may often be missed, as there is nothing to indicate where the metallographic specimen should be prepared for microscopic examination.

The etching test here described eliminates this uncertainty. It is not in itself conclusive as to the presence of steel, but by showing up the areas most likely to contain steel it eliminates the necessity for further search and enables the investigator to proceed at once with the more elaborate preparation of the specimen for microscopic examination.

Three or four sample rings 2 or 3 in. in length are cut from different pieces of pipe or from different points on the same length of pipe. The rings are submerged, one at a time, in a solution consisting (by volume) of

	Per Cent
Hydrochloric acid, c. p., 1.19 sp. gr.	25
Sulphuric acid, c. p., 1.84 sp. gr.	25
Water	50

After being left in the solution about one minute the samples are rinsed in cold water and then with alcohol. Both ends of each sample should then be



Fig. 1—The "Flat" is Filed on the Surface of the Pipe at the Place Indicated by the White Dotted Line

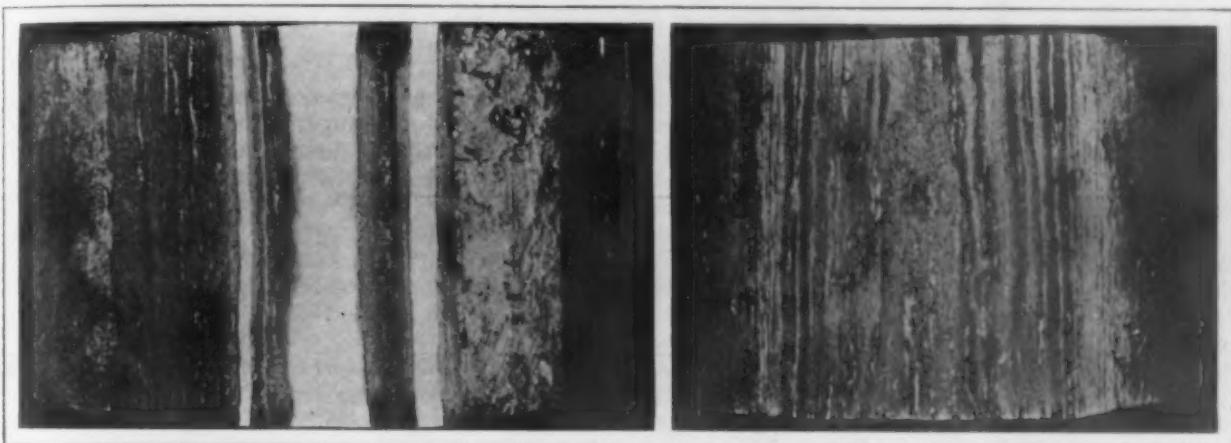
examined to discover bright streaks, which are an indication of steel in the metal. As a rule, an examination of the surface of the metal will not show steel, as steel scrap is usually inserted in the middle layers of the fagot to prevent it from coming to the surface of the finished pipe. If no suspicious looking streaks are found in the first ring etched additional rings are tried. Three or four will usually reveal the steel scrap, especially if rings cut from different pieces of pipe are available.

A "flat" or smooth surface is filed on the outside of the ring suspected of containing steel, as shown by the white line on Fig. 1, where the steel, according to the end indications, is most likely to be found. Filing is stopped when the suspected steel band or bands are half filed away or when their maximum surface is exposed. It is not necessary

Snyder Electric Furnaces in England

W. K. Booth, vice-president Snyder Electric Furnace Company, 53 West Jackson Boulevard, Chicago, has just returned from England. While there he designed and built several Snyder electric furnaces for making ferrosilicon. These furnaces are what is known as the company's FAT type, in which it has succeeded in making silicon 97½ per cent pure. Four of these furnaces are being built and installed at the present time, using a total of 1800 kw. of power input. The installation is being made in a plant which was entirely remodeled and put in operation in a period of four months. This plant is equipped with a very complete chemical laboratory. Considering the present labor conditions in England the work was done in a remarkably short time.

In addition to the above installations Mr. Booth started, and had well under way before his return,



The Three Prominent White Bands in Fig. 2 (Left) Are Streaks of Steel Revealed in Wrought-Iron Pipe by the New Etching Method. Fig. 3 (Right) Is Pipe in Which Steel Was Found After the Same Treatment

to polish the surface to be examined. The flat is now etched in the same manner as the ends, keeping the sample in solution one minute, or as much longer as is necessary to bring out the steel bands in strongest relief, as shown in Fig. 2. If it is desired to keep the etched surface from fading, it is covered with white shellac or some other non-acid coating. Fig. 3 shows a sample of wrought-iron pipe giving no sign of steel under test by this method.

If any doubt exists as to the bright streaks shown on the etched surface being steel, the surface is polished to the highest possible mirror finish, free from scratches, etched with a 5 per cent solution of picric acid and alcohol and examined by means of the microscope.

Summarized, the advantages obtained by the use of this test are these: It eliminates much of the uncertainty incident to the use of the picric acid test alone; it saves time in the preparation of the test specimens and in the examination of the etched surface, and it requires only easily obtained materials and no special technique.

Seeking for More Ore in Wisconsin

W. O. Hotchkiss, State geologist, in a series of addresses on "The Undiscovered Iron Ores of Northern Wisconsin," now being delivered in various parts of the State, indicates that drilling for iron ore on an extensive scale will start in Douglas, Sawyer, Washburn and Bayfield counties within a short time. Surveys have produced unmistakable signs of rich ore fields. Mr. Hotchkiss said the magnetic action during the surveys was almost the same as in the ore fields of Michigan. Because the glacial flow was greater in Wisconsin, the strata covering the deposits are much thicker and there are not so many surface indications as in Michigan.

two furnaces, each capable of melting 12 tons of steel in 24 hr., for Thwaite Brothers, Bradford. These have basic linings and were to be in operation about May 1. A third basic furnace, of the same size, was sold to Thomas Summerson & Sons, Darlington. This furnace will be in operation about June 1. Another furnace, sold to the Daimler Motor Car Company, to be used for the making of automobile cylinders of gray iron, was to be in operation about May 1. A special type of furnace, capable of turning out 5 tons of basic steel in 24 hr., was sold to the National Steel Foundry Company, Leven, Fife, Scotland. This furnace will be in operation about June 1. The furnaces sold to the two companies last named are of the Snyder special doorless type, which has proved so satisfactory in this country.

One of the interesting points in connection with the installation in the plant of the National Steel Foundry Company is that the managing director of that company, Mr. Lake, is also managing director of the Lake & Elliott Company, Braintree, the first in England to install an electric furnace for steel casting work.

Within the next few months the Snyder Electric Furnace Company will have in operation in England at least nine electric furnaces, which is a very good showing, considering that this was done within one year.

The Arkansas manganese field has been the scene of considerable activity the past few months as a result of the rapid advance in the price of ferromanganese. The deposit is being worked rather crudely because of the lack of concentrating machinery, but the ore which promises results from better treatment is being held for future milling. About ten cars per week are being shipped, mostly of high grade ore, going as high as 60 per cent in manganese. The area of the field is about 200 square miles but discoveries are continually extending it. The heaviest production is in the vicinity of Batesville, Cushman and Pfeiffer.

Germany's Position in the Steel Industry

Districts in Which the Development Has Been Greatest—The Raw Material Situation—Competition with the United States

BY H. H. CAMPBELL

In THE IRON AGE for July 15 and July 22, 1915, the writer reviewed the steel industry of Germany and described two manufacturing districts which it was then thought might change ownership after the war. At that time it seemed quite probable that the victor would demand extensive territorial indemnities, and it was and still is interesting to consider what the effect would be on the steel industry of the world if France should annex Lorraine or Germany retain the territory she now occupies.

But as the war progresses it becomes plain that the transfer of territory has fallen to a minor issue. It is true that Italy wishes to gain control of lands to which she has no right, and which she would be quite incapable of governing or developing; but the greater powers to-day would willingly make peace, leaving geographical boundaries unchanged, if larger problems could be settled that involve political, military, financial, economic and social readjustments. For the sake of argument, therefore, it will be assumed that the final treaty of peace will leave political boundaries as they were before the war, and we will try to find out what the chief factors will be in the struggle that Germany will make to capture the steel markets of the world.

POLAND

It would be rash to say that there will be no change in the administration of Poland; but we are not profoundly interested in that province, for it was pointed out in the articles just mentioned that this district has no future. The fuel is poor and iron ore must be brought from Hungary, or through almost prohibitive distances from southern Russia or from Sweden. The steel works are in the extreme southeastern tip of German Silesia, near the point where the frontiers of Russia, Germany and Austria come together, and it is 450 miles to Hamburg, which is the nearest good seaport open all the year round.

Taking into consideration that the total output of the district is only 50,000 tons per month, it may be seen that Poland will not be an important competitor for over-sea trade; but this province is mentioned because it is shut out from the markets of Austria and Russia by protective tariffs, so that it supplies the needs of eastern Germany, thus forcing the plants in the Rhine valley to find a market abroad.

PEINE

There is one steel plant at Peine, between Hannover and Brunswick, which has its own ore mines within 3 miles of the works, while it is within 150 miles of the coal fields of Westphalia. The ore contains from 30 to 35 per cent of iron in the raw state, but if it were calcined the percentage would be from 40 to 45. It contains sufficient lime to make a self-fluxing mixture, so that although the blast furnaces use nearly 3 tons of ore for every ton of pig iron, the coke consumed amounts to only 1 ton.

The pig iron contains 3 per cent of phosphorus, which gives a more ample supply of heat in the basic converter than the iron in western Germany,

while it also carries 3 or 4 per cent of manganese, so that no manganeseiferous ores need be bought, as is the case with minette ore and with the Cleveland ores in England. Moreover, the plant is within 100 miles of both Bremen and Hamburg, so that it is very favorably situated for foreign trade. It can make steel as cheaply as any plant in Germany, and must be reckoned with when we are considering the markets of the world.

WESTPHALIA

Thousands of Americans are familiar with the Rhine between Cologne and Bingen, but few know much about it below Dusseldorf; yet from our viewpoint the most important part of the river is the sluggish channel that extends from Rotterdam up to Ruhrort. Boats drawing 9 ft. of water are constantly carrying the output of Westphalian factories to the seaport on the North Sea, and the river traffic at the port of Ruhrort alone averages 20,000 tons per day.

Just south of the Dutch frontier are coal fields in the valley of a tiny stream called the Ruhr, and it was here that Krupp built his steel works a century ago. It was the universal rule at that time that ore should be carried to the fuel, because a works making finished wrought-iron products would use 5 or 10 tons of coal to every ton of ore. So we find that as early as 1850 the ores of the Siegen and the Lahn were coming down the Rhine about a hundred miles to the coal district around Essen, just as they are coming to-day.

The Bessemer converter was quickly adopted in Westphalia, and in 1870 Germany was making more than one-quarter of all the steel output of the world. The ore was brought from Spain, and such importations have continued ever since; but the production of acid Bessemer steel is growing less all the time, and in 1913 it was only 13,000 tons per month, or less than 1 per cent of the steel produced in Germany.

A new day dawned for Germany when in 1870 the basic converter appeared. The new process was immediately taken up and 18,000 tons of Bessemer steel was made in 1880 from pig iron high in phosphorus. There has been a steady increase in output ever since, and in 1913 Germany made 18,959,000 tons of steel, 56 per cent being made in the basic converter and 39 per cent in the basic open-hearth, there being less than 3 per cent of acid steel.

LARGE IMPORTATIONS OF ORE

For a long time this development of the steel industry took place mainly at the old seat of the iron industry at Westphalia, and that little district has grown to be the most important industrial center in Europe, and now makes one-ninth of all the steel produced in the world. The available supply of ore in the Rhine district was found insufficient, and it soon became necessary to bring ore from abroad for the making of basic iron, and these importations have increased rapidly. In 1913 the imports of iron ore into Germany were as follows: Sweden, 4,564,000 tons; France, 3,811,000 tons; Spain, 3,632,000 tons; Russia, 489,000 tons; Al-

geria, 481,000 tons; Norway, 303,000 tons; Greece, 147,000 tons; Tunis, 136,000 tons; Newfoundland, 121,000 tons; Austria, 106,000 tons; other countries, 161,000 tons—a total of 13,951,000 tons. Some of this ore went to the province of Silesia, especially that from Russia and Austria, but most of it was used in western Germany.

In spite of these enormous importations, more than half of the ore used at the furnaces on the lower Rhine comes from the minette field, a distance of 175 or 200 miles. Part of this is from German Lorraine, just north of Metz; part from Luxemburg, and part from the French province of Meurthe-et-Moselle. The cost of the freight per ton of pig iron will vary with the percentage of iron in the ore, so that in shipping to Westphalia the best of the mineral is chosen, the run of the mine being about 31 per cent in iron, while the ore sent to the Ruhr will carry about 35 per cent. Naturally this better grade is worth more than the average, and yet if a steel plant has its own mines, as is often the case, the rich ore may be charged at the bare expense of mining.

The cost of the ore laid down at Westphalia will be about 6.5c. per unit, which is far from cheap when we consider that the basic converter must be used to make steel. So it is not surprising to find that about all new steel plants are being built at the ore mines in Lorraine, rather than in the coal districts on the Ruhr, since it is cheaper to transport 1.25 tons of coke than 3 tons of ore. Nevertheless, Westphalia remains the best place to work up the steel into finished forms on account of cheap coal, while common labor and highly specialized craftsmen can be had for half the wages paid in the United States.

GERMAN LORRAINE

The ore deposits in the German province of Lothringen extend in a narrow strip along the French frontier from Metz, northward to the Duchy of Luxemburg. In the north, as a rule, the ore is siliceous, while it is calcareous in the south; but both varieties are found in strata of different thickness throughout the region. The ore varies widely in different mines, but the following may be taken as representative:

	Iron	Silica	Lime
Siliceous	32 to 40	12 to 22	7 to 9
Calcareous	28 to 37	6 to 9	12 to 20

The general average is from 30 to 35 per cent of iron and from 10 to 20 per cent of combined water and carbonic acid. The phosphorus is very regular and the pig iron contains about 2 per cent. The manganese in the iron, when using minette ores exclusively, is only about 0.5 per cent, which is not enough to insure good results in the basic converter, so that a certain proportion of manganeseiferous ore must be used, adding quite a little to the cost of the pig iron. Blast furnaces in Lorraine try to get siliceous and calcareous ores in such proportion that the mixture will be self-fluxing, and this often means that a furnace situated close to its own mines will bring part of its ore quite a distance. This is why constantly increasing amounts of calcareous ores are being imported from France.

COSTS IN LORRAINE

The cost of iron at any furnace will depend on whether the ore mine is owned by the furnace company; how much ore must be bought in the open market; whether siliceous or calcareous ore must be purchased to make a self-fluxing mixture, and on the distance through which it must be hauled. The

average cost of the ore at the mines may be taken at 2 cents per unit, to which the freight must be added.

Coal is found at Saarbrucken, about 75 miles away by railroad, and although it is very high in ash and gives a poor coke, the furnaces in the minette district, both German and French, use it extensively; but many companies prefer to pay more for better fuel, and bring coke from Westphalia, the cost of freight alone being about \$2.25 per ton of pig iron smelted. No two furnaces in Lorraine will have the same cost sheet, but it has been stated that pig iron can be made for \$10 per ton, although it is not clear whether this allows for stoppages, derangements, general repairs and depreciation; while it is usually best on general principles to add something to such an estimate of costs.

THE EXPORT TRADE

Unfortunately the steel plants of Lothringen do not have a market close by. A few miles to the west is the tariff barrier of France, while on the north is Belgium and on the south are the Alps. Over-sea shipments must go right past the steel works of Belgium or the lower Rhine, and be loaded either at Rotterdam or Antwerp, and to an impartial observer it seems an economic wrong that western Germany should be compelled to ship through foreign ports.

For a hundred years Germany has been trying to get Holland to dredge the lower Rhine, and the work is not finished yet, even according to plans mutually agreed upon many years ago. The case of Antwerp is still worse, because the steel plants of Belgium are direct competitors for the trade that Germany supplies through that port; just as American manufacturers are under a big handicap in shipping to many ports in South America, because they must send goods to be trans-shipped on a British vessel, while English manufacturers are rivals for the same trade.

CARTELS

There have been no combinations of steel plants in Germany similar to what we have seen in the United States, but there are syndicates which find shelter behind a protective tariff and fix prices for all material, whether sold at home or abroad, whether for government railroads or for private companies, and they also apportion both domestic and foreign orders. The government not only allows this, but not long ago a high state official attended a meeting of the Union of Steel Manufacturers and made a public statement that the government heartily approved such organizations. It is even stated that a decree has been issued recently requiring all steel producers to join a trust that will handle export trade after the war.

These syndicates have had the troubles that always and everywhere have confronted such pools. The relative finishing capacity of the various plants must in the long run be the basis of apportionment, and so there is a continual race to build new mills which are expected to stand idle. If prices are low, nothing is gained by such a syndicate; while if prices are high, in wire nails, for instance, new nail factories are built by every steel plant to give additional tonnage to its converters. There are always dissensions, secessions, reapportionments and new agreements that never settle anything.

In handling foreign orders, however, these pools are of great benefit, for it often happens that such business is taken at a low price, and in Germany the plant rolling the material is compensated by the other members of the syndicate who have profited

by the relief of the home market, so that no one works is forced to sacrifice itself in order that the country as a whole shall get this additional trade.

It must be remembered that prices in the markets of the world do not follow quotations at home; they may be higher this summer and lower next year, and we cannot keep trade by seeking it only as a stop-gap in dull times. If any one plant will take low-priced foreign orders in boom times, and thereby bring work to our factories from abroad, every one in the business and everybody in the country is benefited.

But passing over this matter of recompensing individual plants, it is not fair to subject American manufacturers to the competition of this German syndicate, and then deny them the right of self-defense. Either our Government should give them full liberty to combine, and use the same weapon as their opponents, or a tariff should be imposed high enough to keep out goods which are openly and confessedly "dumped" on our market.

GERMANY'S FOREIGN TRADE

In the year 1912 Germany's imports exceeded her exports by \$413,000,000. This was partly offset by receipts from American tourists, ocean freights and dividends on foreign investments; but the income from the carrying trade cannot be compared with that of Great Britain from her merchant marine, while Germany falls way behind England and France in the money coming from tourists and foreign enterprises.

Germany sends goods all over the world; but in the past Great Britain, France, Russia and Belgium have together taken one-third of her total exports. We cannot suppose that there will be a perpetual boycott of Germany by the entente powers, but it does seem inevitable that sales in those countries will be much reduced for a long time after the close of the war, and it is in the United States and in South America that Germany will look for markets to take the place of those that she has lost.

We must expect fierce competition in the future from an energetic and resourceful people, who will be aided by all the power of an autocratic government. It remains to be seen whether German manufacturers are also to be assisted by our Congress, or whether we are to be protected by tariff legislation before our mills are shut down and our people thrown out of work.

The sixth of a series of short talks covering the use of fuel in power stations has been issued by the Fuel Engineering Company of New York, 106 East Nineteenth Street, New York City. Like the others, it takes the form of a little pamphlet printed for more or less general distribution. One of the burdens of the argument is that manufacturers are too often either too prosperous or not prosperous enough to economize. Some of the points on which special emphasis is placed are that power plant waste is prevented, not by instruments, but by what is done with the facts they produce; boilers and grates play a small part in the day-to-day changes in plant efficiency; combustion efficiency is the heart and soul of operating economy; efficiency is too often confounded with economy.

W. H. Coverdale and W. W. Colpitts announce that the business of W. H. Coverdale & Co., Ltd., consulting engineers, will hereafter be conducted under the firm name of Coverdale & Colpitts. The address of the firm is 66 Broadway, New York.

The Aldrich Publishing Company, publisher of the *Boiler Maker* and *Marine Engineering*, has moved to suite 1403 in the new Printing Crafts Building, Eighth Avenue and Thirty-fourth Street, New York City.

Book Review

Coal and Coke. By Frederick H. Wagner. Pages, xii + 481, 6 x 9 in.; illustrations, 137. Published by the McGraw-Hill Book Company, Inc., New York. Price, \$4.

Only the direct manufacture of war munitions has exceeded in development the enormous expansion of the by-product coke-oven industry caused by the war. This country was suddenly cut off from supplies of chemical products derived from coal product bases and, as a result, these industries were given a tremendous impetus. The book under review, coupled with the author's former book on "Coal Gas Residuals," covers the field fairly well, and is a welcome addition to our coke oven literature.

The first part, comprising five chapters, is devoted to coal; its origin, classification, oxidation, coking quality, analysis and bulk storage are discussed in the order named. The subjects are treated fairly and clearly. The space assigned to coking coals is far too small and more attention is paid to the small anthracite deposits than to the great bituminous deposits of the country. There is such variation in the coking coals, ranging as they do from 17 or 18 per cent to 40 per cent volatile, and their properties are frequently so different that a full description of them would add much to the value of the book. The analyses are few and phosphorus is neglected entirely. While of less importance to-day in metallurgical coke than formerly, its percentage is, at times, vital.

The oxygen-hydrogen ratio as an index of the cokability of a coal is discussed, but no reference is made to the very illuminating studies of Vivian Lewes. Professor Lewes has shown the reason for the value of this index and his work appears to have placed the analysis of the coking properties of a coal upon a firm basis. Some of the financial data are misleading unless further explanation than the author gives be available.

The chapter upon analyses is excellent, except that a description of the volatile matter determination methods used abroad and a comparison of the results by each method would be helpful in comparing European data with American, as frequently must be done.

Chapter V, upon preparation and storage, consists largely of a reprint of a series of articles which appeared in *Stahl und Eisen* and many of the methods illustrated have never been attempted here, nor, in all probability, will they be. Washing and drying receive far too small attention, as they are increasingly important. The electrostatic cleaning methods are not mentioned. These appear to have a future.

The second part of the book deals with coke and is largely employed in describing the several methods of carbonization. Retorts of standard type, inclined benches, coke ovens and chamber ovens are all as fully covered as the limitations of space permit. Several of the coke oven types illustrated are obsolete to-day, and other descriptions are not complete enough to be clear. The cuts could be improved in their detail. The author views the matter almost exclusively from the viewpoint of a gas manufacturer, while the great development in recent years in ovens has been for metallurgical coke. The quality of coke made is usually not discussed. Some of the apparatus described has had limited development in the United States.

Pyrometry, combustion, heating and waste gases are well treated. Euchene's "Thermic Reactions" are given in much detail, and will be welcomed by coke oven and gas engineers. The results are, it is regretted, confused by a loose use of English and French physical units.

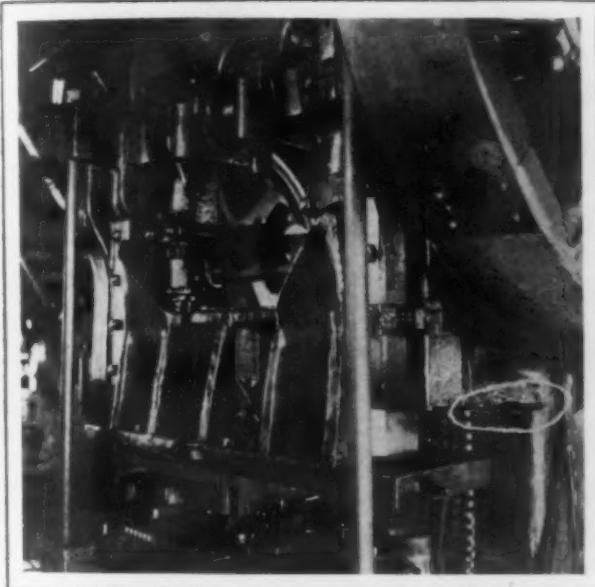
The book is timely, and is one that is well worth reading, and that will be helpful to anyone engaged in coal gas or metallurgical coke manufacture. The author has been scrupulously careful to give ample credit in the very many quotations made from the works of others. In this he sets a good example which could be followed to advantage by other authors. S. M.

The Stinson all-steel resilient tire for vehicles, patented Sept. 1, 1914, has now been put on the market by the Stinson Tire Associates, Gardner, Mass.

Newark Foundrymen's Association

The Newark Foundrymen's Association, Newark, N. J., at a meeting held May 3 re-elected the officers who have served in the past year. They are: H. P. MacDonald, Snead & Co., president; James Flockhart, Maher & Flockhart, vice-president; James Campbell, Maher & Flockhart, treasurer; J. Smylie Kinne, Riverside Steel Casting Company, secretary. The following executive committee was elected: James Flockhart, Louis Sacks, G. Hannay, Oscar Barnett Foundry Company; Arthur E. Barlow, Barlow Foundry Company, and E. M. Taggart, J. W. Paxson Company.

Mr. MacDonald, in a brief address to the members, said that for the first time in years the foundry industry was feeling a shortage in unskilled labor, and that the situation will not be helped by one foundry stealing another's men, as in the end the only one who benefited from this procedure was the man who went from one job to another following higher wages. Incidentally, it was questionable if the man himself benefited. "This is a time when we can show how much consideration we have for the other fellow and for the trade generally," said Mr. MacDonald. Where skill is



The Nature of the Crack in the Machine Frame Is Indicated in the Views of the Front and Back

required he believed it better for employers to endeavor to make men, rather than entice them away from other employers.

The meeting was addressed by T. Everett Austin, assistant manager of the crane department of the Niles-Bement-Pond Company, Philadelphia, on the uses of the electric traveling crane in foundries. Every application of cranes in foundry work was referred to by Mr. Austin, and most of them he illustrated with the stereopticon.

Amalgamated Association in Session

The Amalgamated Association of Iron, Steel and Tin Workers met in annual convention in Cleveland, Ohio, last week. About 135 delegates are understood to have been present, and addresses were made by leading officials of labor organizations. It is intimated that the wage scales to be formulated, governing bar-iron, sheet and tin-plate mills, that will be presented to manufacturers this month or early in June, will carry advances over the rates in the present scale, which expires June 30. These advances will be based on the high prices ruling on all kinds of iron and steel products. Mill workers belonging to the Amalgamated Association have insisted to their officials that they are entitled to good advances over the present scale.

The Hardware Board of Trade, Ltd., has removed its offices from 127 Duane Street to the East River Savings Bank Building, 291 Broadway, corner of Reade Street, New York.

MACHINE FRAMES REPAIRED

Two Cases of Breaks in Heavy Parts Gas Welded—Savings Effected

The Portable Elevator Mfg. Company, Bloomington, Ill., recently made use of oxy-acetylene welding in effecting machinery repairs with a resultant saving in one instance of \$550 and in two cases with a complete restoration of the machine's strength and usefulness. A heavy 85-ton punch press shortly after being installed developed a serious break in the main frame. Front and rear views of the crack are shown in the accompanying illustrations. A new frame would have cost about \$700. The Ox-weld Company, Chicago, repaired it for \$150.

In repairing the break, it was necessary to dismantle the entire machine, lay it on its side, cut away almost the entire frame at the broken portion, at an angle to the crack of about 45 deg. Then two large blow torches were played on the



part until it was a bright red heat, after which the process of building it up with the oxy-acetylene torch proceeded, the work requiring about 20 hr. of continuous work.

After the metal cooled, the press was put back on its foundation and the main shaft, which passes through four solid bearings in the main frame, was found to line up as perfectly as it did originally. Every part went back without the least bind, and the frame of the press is regarded stronger to-day than a new one would have been, because the weak part is built up and reinforced with pure iron.

In the second instance the entire top bearing on one side of the frame of a 10-ft. power shear was broken off. The distance through the fracture was about 15 in., but the break was readily repaired by a local firm, using an oxy-acetylene welding outfit, and the machine has been in constant use since. Obviously, both jobs afford an exceedingly severe test of the weld.

The submarine of to-day and to-morrow is discussed in a lengthy article forming one of the chief contributions of the April number of the publication issued by the New London Ship & Engine Company, Groton, Conn. The publication is known as the *Nlsecos News*, and a copy of the issue, which is the April number, can undoubtedly be had for the asking.

The Manufacture of Large Forging Ingots

Corrugations with Sharp Curves Give Best Results—Metallurgical and Open-Hearth Problems—The Use of Titanium—Wide Nozzles for Pouring

BY ROBERT C. WOODWARD*

The production of large forging ingots is given but little attention in technical works of reference. Such ingots can be successfully cast in sand and several of our largest steel makers follow this plan. The objection to this method is the high molding cost, which has led to the efforts to cast the ingots in iron molds that can be used many times. They can also be cast in iron molds by resorting to bottom pouring. This method has the same objection—the molding cost—but in a lesser degree.

The few manufacturers who have developed the method to a profitable commercial basis have carefully guarded the secrets of their progress. Some of their experiments have given results that the investigators themselves were unable to explain satisfactorily; but as the results were acceptable many rule-of-thumb practices were incorporated into the general scheme, so that the successful production of large forging ingots is widely regarded as an art rather than as a technical accomplishment.

The writer had occasion as a steel works metallurgist to make a thorough and careful study of this subject. The proposition was to make plain carbon basic open-hearth steel forging ingots, varying in weight from 4 to 25 gross tons, by top pouring them in iron molds, made according to the company's own designs. The steel had to have an analysis suited to meet Lloyd's inspection and tests, which were about as follows:

	Per cent
Carbon	0.25 to 0.30
Manganese	0.45 to 0.55
Sulphur	Under 0.035
Phosphorus	Under 0.025
Nitrogen	Under 0.010

THE STYLE OF MOLDS

Previous experience had shown that molds having a square or rectangular cross-section (Fig. 1) were not adapted to this work. The stated objections were that the corners of the ingots cooled so much faster than the cores that internal stresses caused the ingots to crack transversely; and if the ingot cooled without cracking, the corners were often burned in the soaking process. To overcome this objection molds having an octagonal cross-section (Fig. 2) were furnished, but the ingots continued to crack. Finally the molds were so designed that there were no plane surfaces to come in contact with the molten steel. Molds of this design, corrugated, stood the test (Figs. 3 and 4). The writer's explanation of this is as follows:

After the steel is teemed into the container the part to solidify first is naturally the surface of the ingot, which is chilled by the mold, and crystallization is started at right angles to the ingot's surface. If this is a plane surface it follows that the axes of crystallization are parallel lines. This results in the formation of cleavage planes, injurious to the ingot. But if the surface of the ingot is circular and corrugated, the axes of crystallization are crossed and interwoven and leave no cleavage planes. The writer observed from experience that the sharper the curves of the corrugations the bet-

ter the average results. Fig. 3 represents a better design of mold than does Fig. 4.

Of course, there were many problems to solve and many details to be worked out. The molds furnished only one of many vexing features. The grade and proper proportions of the charge, details of working the heats, temperature of the steel at the different stages of operation, slag adjustment, additions of alloys, pouring the steel, reducing the piping and segregation and all other details had to be decided on and worked out in their correct relation to each other in the face of too frequent failures, and in spite of the inertia and the "I told you so" of antiquated shop routine.

THE MATERIALS AND THE ORDER OF CHARGING

We were furnished an ordinary grade of merchant furnace basic pig iron, with a phosphorus content under 0.500 per cent, a sulphur content under 0.045 per cent and not more than a trace of copper. The charges were proportioned about as follows:

	Pounds	Per Cent
Pig iron	20,000	40
Heavy melting scrap	20,000	40
Pit scrap	5,000	10
Low phosphorus crops (high carbon)	5,000	10
Total	50,000	100

The usual order of charging was:

	Pounds
Pig iron	10,000
Heavy melting scrap	20,000
Low phosphorus crops	5,000
Pit scrap	5,000
Pig iron	10,000

Although this is the usual order, it is not a set rule. Furnace conditions and other factors sometimes call for a different sequence.

The charge is melted under a hot, oxidizing flame, which is slackened off gradually during the refining period, and at tapping time the gas is entirely shut off. The aim is to take the heats out at about 1500 deg. C. and pour them as cold as possible. A number of ingots were lost through misjudging the temperature of the steel at this critical point, which will be discussed later. As soon as the heat is melted and the lime is off the furnace bottom the slag is thinned with judicious additions of fluorspar and the heat stirred well. Meanwhile a fracture test is made from the bath and drillings sent to the laboratory for verification and for determination of the sulphur and phosphorus content.

THE PHOSPHORUS DETERMINATION

At this point the writer wishes to comment on the estimation of phosphorus in steel, in connection with the determination of sulphur by the "evolution method," universally employed as a rapid test by steelworks chemists. He has often observed that some plain carbon steels go into a clear green solution in hydrochloric acid and perhaps the next heat from the same furnace, supposed to be the same grade of steel, dissolves into a black solution. This blackness is an unfailing indication of high phosphorus, and varies directly as the phosphorus content. Therefore, we never determine the phos-

*Metallurgist for the Sweet's Steel Company, Williamsport, Pa.

phorus in bath-tests, but observe the solution in the evolution flask, and work the slag accordingly.

As our heats melt high in phosphorus, the slag, after being thinned, is enriched with burnt lime and dolomite. We use as little ore as possible but stir the bath thoroughly and often. The importance of slag adjustment, particularly in basic furnace work, is so fully recognized that it seems needless to go into more details here. This is especially true because it is a matter of close and direct observation, and involves a personal equation that can only be solved by intimate contact with the work. It is sufficient to say that we aim to keep a strongly basic and sufficiently liquid slag during the working of the heats, until the phosphorus and sulphur are well within the specified limits. Then the slag is thickened somewhat and the heat tapped under a strongly basic and fairly thick slag.

CARBON CONTENT WITHOUT RECARBURIZATION

We try to get our carbon content without recarburation, in open-hearth parlance, to "catch them coming down." All furnacemen know how uncer-

as a reagent to remove nitrogen. When the writer first became connected with this proposition there were numerous complaints of nitrides in the steel. On account of the affinity of titanium for nitrogen he advised the use of this alloy to overcome the fault, which it did successfully. A small amount (3 lb. per gross ton of steel) is added to the ladle with entirely satisfactory results.

Several questions arose as to the best way to make these additions. When ferromanganese or any other alloy is added to the bath it first takes on a coating of slag, which retards its solution and carries some of the slag down into the steel as a mechanical mixture. Both of these disadvantages may be overcome by giving the ferromanganese a superficial wetting. The thin film of moisture is transformed into steam so suddenly that it blows away the adjacent slag, permitting the alloy to drop directly into the metal.

The ferrosilicon was at first added to the steel in the ladle in large lumps, which is bad practice. Sometimes, after a heat was poured, these lumps would be found still remaining in the bottom of the

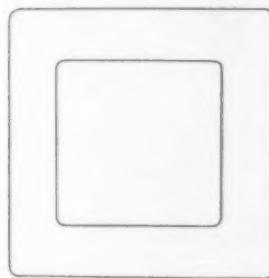


Fig. 1

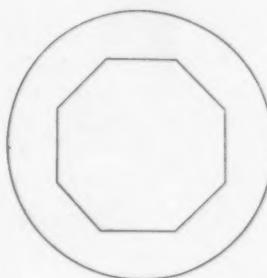


Fig. 2

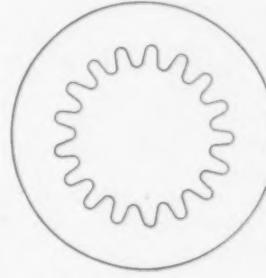


Fig. 3



Fig. 4

Plan of Ingot Molds of Rectangular and Octagonal Shape

Plan of Ingot Molds Having Sharp Curves or Corrugations.
Fig. 3 represents a better design than Fig. 4

tain this is. We never received complaints of too soft steel, however, and aimed for the lower limit of the carbon specification. Then if the steel shows an analysis of 0.20 per cent or even 0.18 per cent carbon the result is more satisfactory than when recarburetors are added. This does not apply to heats that melt too low to work, but to ordinary heats that are satisfactory except for having dropped a few points too low at the finish.

The writer does not favor the addition of cold pig iron at the finishing of a forging heat, because the heats are already very low in temperature, as will be explained later, and because it disturbs the slag adjustment. Recarburetorization in the ladle is uncertain. Sometimes most of the carbon dissolves in the metal and sometimes it nearly all burns away. It tends strongly towards segregation, and often means defective ingots.

The regular additions of alloys consist of 80 per cent ferromanganese, added to the bath, and 50 per cent ferrosilicon and 8-12 per cent ferro-carbon-titanium, added to the ladle. The furnace is theoretically the ideal place to make all the additions or rather it would be if there were not some very practical reasons that prevent it. There is generally very little segregation in the bath, and it is here that the steel should be made, not in the ladle. But ferrosilicon is too strongly acid to be added through a basic slag. It disturbs the slag balance and a considerable proportion of the alloy is wasted.

THE USE OF TITANIUM

As for the ferrotitanium we do not use it as an alloy, but as a scavenger of occluded slag, and

ladle. It finally became the practice to pulverize this alloy until no piece should have a dimension greater than three-eighths of an inch. This practice is becoming general, especially in foundries and other works where heats not larger than 25 gross tons are made. The writer knows of one steel foundry where the ferrosilicon is ground to a powder. The obvious and true reason for this is: the finer the addition is ground the more uniform is its mixture with the steel, and the more surface of a given mass exposed to the solvent action of the steel the more rapidly the solution is effected.

POURING THE STEEL

The pouring of the steel presented one of the most knotty problems. This was because of, or perhaps in spite of, the fact that several factors had to work in co-ordination. These factors were the pouring temperature of the steel, the rate of pouring and the size of the nozzle.

When the nozzle is first opened over a mold 18 ft. deep the metal, as it strikes the bottom plate, is bound to splash the sides of the mold to a height of several feet. These splashes often meant seams and sometimes cracks. If the stream struck or spattered the sides of the mold it produced the same result. We partly overcame this by setting up the molds with a plumb-line, but it was not always possible to get the nozzle brick in proper alignment. To admit the metal into the mold with as little force as possible at the start, the nozzle was opened just a little. This did not help at all, because it caused the stream to spray the sides of the mold. In the effort to start with as small a stream as possible, and to have better control of the stream,

we used small nozzle bricks in the ladle. For some reason we were quite successful for a short time, long enough for us to draw false conclusions.

When the ingots started to go wrong again we used nozzle bricks having an inside diameter as small as $1\frac{1}{8}$ in. The result was that cold heats would not pour and our practice went from bad to worse. Finally, in an attempt to save such a heat, the writer dumped it into the mold over the top of the ladle. There is nothing astonishing in this feat but we were not equipped to do it conveniently. Our ladle cranes have no auxiliary hoists, so a second crane was hooked on the bottom of the ladle and by lifting with this crane while lowering with the ladle crane, it was managed with very little spill. We skimmed off the slag as well as possible, but considerable of it went into the mold. We were less than two minutes in actually pouring the heat. The ingot showed a rough surface when it was stripped but seemed sound. It was later forged successfully.

As a result of this, large nozzle bricks were again tried, but without attempting to cut down the stream at any time. A $3\frac{5}{8}$ nozzle is now our standard and the heats are literally dropped into the molds. The walls of the containers are splashed as before, but these splashes are so quickly covered with the body of the steel that they do no damage. By using these large nozzles the metal can be poured at a temperature much lower than was possible before. The molds are filled with steel that solidifies before extensive segregation can set up and pipes but very little. The writer believes that much of the success of this open-hearth practice in the forging ingot game is due to pouring very cold steel.

PIPING OF THE INGOTS

The question of piping is a serious one. There are numerous molds with antipiping features and special mold-top bricks, "hot tops," that are thoroughly covered by patents. We were not afforded the opportunity of trying any of these. The writer recommended a mixture of sand and coke dust, to be spread over the tops of the ingots as soon as they were poured. Pulverized petroleum-coke is used with such good results that the top discard is frequently under 2 per cent.

Pouring the steel as cold as possible gave the ingots a rough surface that detracted from their appearance. To avoid this the inside walls of the molds were covered with tar. When the molten steel was introduced the heat caused most of the tar to run to the bottom and filled the molds with such dense fumes that we could not see anything that was taking place at the bottom. So the tarring process was abandoned and the following procedure substituted:

After the mold has been set up ready for pouring a bucket of tar is placed on the bottom plate and heated by having a red-hot billet lowered into the tar. The top of the mold is now covered with iron sheeting and the tar allowed to smoke off until the inside of the mold is covered with a layer of soot about $\frac{1}{4}$ in. thick. This does away with the cloud of smoke, permitting us to watch the stream of steel; and it also gives the ingot a smooth surface, free from superficial seams and laps. When drops of steel spatter against the sides they have less tendency to adhere and generally fall back into the body of the rising metal.

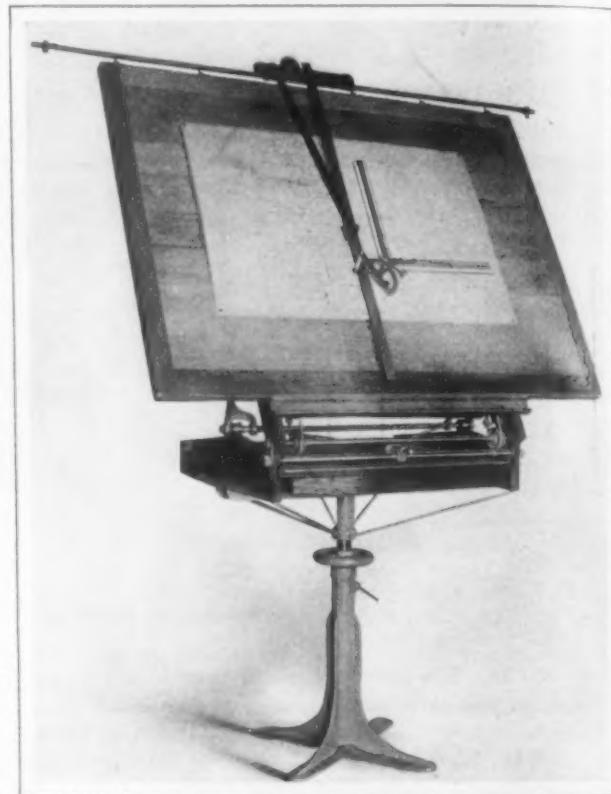
As a result of these practices the percentage of good forging ingots has increased from 60 to 93. The remaining 7 per cent is not a complete loss, as most of the ingots can be forged, but with a higher

percentage of scrap. They may require larger crops at either or both ends or the rough forging may require more machining.

In conclusion the writer wishes to say that the production of good forging ingots requires at all times a close attention to detail. This, coupled with constant uniformity of routine, is the keystone in the arch of successful big ingot practice.

An Inclined Adjustable Drawing Board

For use with either its vertical or horizontal T-square and combined protractor, the Emmert Mfg. Company, Waynesboro, Pa., has developed a vertically inclined adjustable drawing board. The drawing board



A Drawing Board of the Vertically Inclined Type That Can Be Adjusted to Any Desired Angle and Slid Toward or Away from the Draftsman

can be adjusted to any desired angle and a cylindrical counterbalance weight located behind the drawing board, a stationary base frame and a sliding horizontal board or leaf carrying a drawer form part of the equipment. The board may be moved upward when the lower half is to be worked on and lowered when the other half is to be put into use. The board is made in sizes ranging from 24 x 36 in. up to 36 x 72 in.

The Cost to Industry of Illness

As a result of unnecessary sickness and accidents the 33,000,000 industrial workers in the United States lost about 284,000,000 working days each year as a result of sickness alone, according to Dr. Donald B. Armstrong, director of the department of social welfare of the New York Association for Improving the Condition of the Poor. He figures the financial loss, including wages, loss to industry and the medical cost at nearly \$500,000,000, and yet at least one-half of the sickness, he says, was from strictly preventable causes.

The Pennsylvania Department of Labor and Industry, Harrisburg, Pa., has issued a bulletin containing all the rules and regulations of the Bureau of Workmen's Compensation, a list of forms required, etc. The bulletin is in pamphlet form and copies may be obtained on application to the Bureau.

Status of American By-Product Coke*

Recovery of Tar and Ammonia—The Benzol Situation Now and After the War—Present American and European Practices Compared

BY THOMAS C. CLARKE†

In American practice the matter in which improvement has been least is the recovery of tar and ammonia. In Germany and England tar recovery is much better than with us. Theoretically our coals should yield more than 7 gal., which I showed as the recovery in the balance sheet, and ammonia more than 1 per cent. As the coking time was brought down, the yields of tar and ammonia went with it; and as the coke ovens are principally being run to supply metallurgical coke this subject has not been given the attention that it deserves.

BENZOL AS A MOTOR FUEL

With the exception of the Semet-Solvay Company the benzol industry is in its infancy. Plants are being built in practically every coke-oven installation since the war began, and what the result will be after the war remains to be seen. Logically its first and greatest market for benzol will be as motor fuel. The production of gasoline from crude oil is:

	Gasoline, Barrels	Crude Oil, Barrels
1904.....	6,920,000	117,100,000
1909.....	12,900,000	183,200,000
1914.....	34,915,000	265,800,000
1915.....	41,600,000	267,400,000

The number of automobiles licensed shows:

1905.....	85,000
1910.....	400,000
1914.....	1,253,000
1915.....	1,750,000
1916.....	2,225,000

*As of the first of the year.

It is interesting to note that while the production of crude oil from 1914 to 1915 only advanced 2,000,000 bbl., gasoline in the same period advanced nearly 7,000,000 bbl. These figures are taken from the New York Sun of April 17, 1916.

Assuming the production of the old type ovens at 5 tons of coal per day of 24 hr., and the larger ovens at 15 tons, and getting a yield of 2½ gal. of 50 per cent benzol per ton, we find the benzol production to be 84,990,000 gal., or 2,694,000 bbl. per year. Fear has been expressed that after the war the sudden dumping on our markets of 85,000,000 gal. of motor fuel would break the price badly and make a number of lean years for the coke oven benzol producer.

If 200,000 of the 300,000 Ford cars produced annually remain in this country and have an average mileage of 5000 per car and consume a gallon of gasoline for every 15 miles, the annual consumption will be 66,666,000 gal. Since the benzol output, if all sold for motor spirits, only amounts to 84,990,000 gal., and one make of car uses 66,000,000 gal. with the increase in automobile production that the statistics above show it seems to me we are fortunate to have a new fuel coming on the market.

The production of tar in gallons in 1905 was 36,379,000; in 1910, 69,780,000 gal., and when the various plants now built and building are in operation these figures will advance to 237,947,000 gal. of tar.

Sulphate of ammonia production in 1905 in the United States was 65,000 tons of 2000 lb.; in 1910, 115,000 tons. When the present ovens now built and building are operating the production will be about 340,000 tons. The price of these commodities has been 2.5c. per gallon for the tar, and for the sulphate of ammonia around \$60 a ton for the past ten years.

THE GOVERNMENT'S PROPOSED NITRATE PLANT

I cannot leave the subject of sulphate of ammonia

*From an address before the New York Section of the Society of Chemical Industry, April 21. The first part was published in the issue of May 4, 1916.

†Consulting engineer, New York.

without referring to its connection with the proposed new nitration plant of the Government.

When in Germany last summer I became so thoroughly impressed with the necessity for preparation in this country that I yield to no one in my desire to assist toward that end, appreciating the immediate necessity of being self-contained in the matter of nitric acid, and not relying on Chilean nitrates.

I was told in Germany that they were securing the nitrogen necessary for munitions by the direct electric arc process and by releasing the ammonia from the sulphate of ammonia and oxidizing it into nitric acid. This latter process, invented some years ago by a German chemist, was not commercially successful on account of the cheapness of Chilean nitrate, but since the outbreak of the war it is one of the principal sources of supply. The abnormal conditions existing during a war justify the use of these more expensive methods of securing nitrogen, for the increased cost of these methods is negligible.

The Chamberlain bill, which I had supposed was for an increase in our army, seems to be broader in its scope, for it contains an amendment appropriating \$15,000,000 for a hydro-electric plant, for the production of nitrogen for the army during the war times and for fertilizer in peace times.

If this is a war measure, should not the Government establish a number of plants around the country for converting sulphate of ammonia into nitric acid, and should it not arrange with the many hydroelectric companies to take power from them during the duration of the war and secure direct nitrogen from the air? Should not the plants be broken up into small units, the geographical location of these plants being made with due regard to freight rates and the accessibility of material? I cannot seriously contemplate the Government putting its entire reliance in one dam, which treachery, or a bomb from an aeroplane, could annihilate, thereby destroying the source of supply.

We may well, then, question why the Government contemplates this investment, and the answer seems to be that it wants to go into the fertilizer business, in competition with private capital that has invested millions of dollars in the same industry, or else why spend \$15,000,000 building dams to sell power to produce nitrogen for fertilizer purposes, 99 per cent of the time during peace, in order to have nitrogen 1 per cent of the time during war, when during that period they can get all the nitrogen they want from sources at present established. If private capital has never been able to make the direct recovery of nitrogen from the air by the electric arc process commercially profitable why assume the Government can?

NITRIC ACID FROM CYANAMID

It is then natural to assume that the only process that has found a foothold on this continent will be adopted, which is the cyanamid process, a process for the recovery of nitrogen from the air in the form of calcium cyanamid at a cost for power much less than the electric arc process; from this calcium cyanamid, the ammonia can be produced by further operations, and like the ammonia released from sulphate, oxidized into nitric acid, but why do this when sufficient nitrogen is already being recovered from coal?

I believe that the Government has entered into this enterprise believing that there is a nitrogen shortage, predicated this belief on the importations in the past of sulphate of ammonia. In 1914 the consumption of sulphate of ammonia, or its equivalent, in the United States was 272,000 tons, of which the United States imported 83,000 tons, but, as previously stated, in 1917

the production will be 340,000 tons. The increase in consumption of ammonium sulphate in the United States in the last three years, from figures available, is as follows:

	Consumption, Tons	Increase, Tons
1911.....	230,000	16,000
1912.....	246,000	16,000
1913.....	262,000	10,000
1914.....	272,000

This shows that the production is increasing in a greater ratio than is the consumption. Would it not seem reasonable, then, to suppose that the Government would foster the sulphate of ammonia industry, and encourage the building of by-product coke ovens and arrange for securing, in case of war, the sulphate of ammonia, benzol and toluol necessary for the making of adequate munitions for such a war, and encourage the further building of by-product coke ovens if the pros-

mund and Wesel, which is the lower Rhine-Westphalian steel district of Germany. After having seen just before I left the practice and mechanical refinements of the Gary plant, visiting the coke-oven operations in Europe brought back very vividly the practice here of 10 years ago. One realized how entirely we had gotten away from the old world's standard.

There were only two things that I saw where I considered they were in advance of us. One was a gas engine installation and the other the use of mixed gases. At one of the big German steel plants they have a 10,000-hp. installation of gas engines, generating electricity, which cost them complete \$300,000. That same installation over here would have cost \$1,000,000, which may explain why the large gas engine unit is less in vogue here than there.

The other instance was at Skinningrove, where Ernest Bury, who has contributed liberally to coke-oven

List of By-Product Coke Ovens of the United States Now Built and Building

Type Ovens	Benzol No. Recov- Ovens ery	Type Ovens	Benzol No. Recov- Ovens ery
American Steel Wire Company, Cleveland, Ohio.....	Koppers 180 Yes	Minnesota Steel Company, Duluth, Minn.....	Koppers 90 Yes
Allegheny By-Product Coke Company, Glassport, Pa.....	Otto 120 Yes	Michigan Alkali Company, Wyandotte, Mich.....	Semet-Solvay 30 Yes
Brier Hill Steel Company, Youngstown, Ohio.....	Koppers 84 Yes	Milwaukee Coke & Gas Company, Milwaukee, Wis.....	Semet-Solvay 160 Yes
By-Product Coke Corporation, So. Chicago, Ill.....	Semet-Solvay 280 Yes	New England Gas & Coke Company, Everett, Mass.....	Otto 400 ?
Cambria Steel Company, Johnstown, Pa.....	Otto 372 Yes	National Tube Works, Benwood, W. Va.....	Semet-Solvay 120 Yes
Cambria Steel Company, Johnstown, Pa.....	Koppers 92 Yes	National Stamping & Enameling Company, Granite City.....	Roberts 240 ?
Central Indiana Gas Company, Muncie, Ind.....	Klonne 22 ?	Niagara Coke Corporation, Buffalo, N. Y.....	Otto 100 Yes
Citizens Gas Company, Indianapolis, Ind.....	Otto 100 Yes	Northwestern Iron Company, Mayville, Wis.....	Otto 72 Yes
Coal Products Company, Joliet, Ill.....	Koppers 35 ?	North Shore Gas Company, Waukegan, Ill.....	Semet-Solvay 13 No
Coal Products Company, Joliet, Ill.....	Wilputte 18 Yes	Pennsylvania Steel Company, Lebanon, Pa.....	Semet-Solvay 120 Yes
Central Iron & Coal Company, Tuscaloosa, Ala.....	Semet-Solvay 60 Yes	Pennsylvania Steel Company, Steelton, Pa.....	Semet-Solvay 40 Yes
Cleveland Furnace Company, Cleveland, Ohio.....	Semet-Solvay 100 Yes	Philadelphia Suburban Gas & Electric Company, Chester, Pa.....	Semet-Solvay 40 Yes
Chattanooga Gas Company, Chattanooga, Tenn.....	Roberts 12 ?	River Furnace Company, Cleveland, Ohio.....	Koppers 240 Yes
Carnegie Steel Company, Clairton, Pa.....	Koppers 640 Yes	Republic Iron & Steel Company, Youngstown, Ohio.....	Koppers 143 Yes
Colorado Fuel & Iron Company, Pueblo, Col.....	Koppers 120 Yes	Semet-Solvay Company, Dunbar, Pa.....	Semet-Solvay 110 Yes
Dover By-Product Coke Company, Canal Dover, Ohio.....	Roberts 24 Yes	Solvay Process Company, Delray, Mich.....	Semet-Solvay 175 Yes
Empire Coke Company, Geneva, N. Y.....	Semet-Solvay 46 Yes	Solvay Process Company, Syracuse, N. Y.....	Semet-Solvay 40 Yes
Gulf State Steel Company, Gadsden, Ala.....	Koppers 37 Yes	Sharon Coke Company, Sharon, Pa.....	Otto 212 Yes
Inland Steel Company, Indiana Harbor, Ind.....	Koppers 86 Yes	Seattle Lighting Company, Seattle, Wash.....	Klonne 22 ?
Inland Steel Company, Indiana Harbor, Ind.....	Koppers 44 Yes	South Jersey C. E. & T. Company, Camden, N. J.....	Otto 150 Yes
Indiana Coke & Gas Company, Terre Haute, Ind.....	Gas Mach. Co. 30 ?	Seaboard By-Product Coke Company, Jersey City, N. J.....	Koppers 110 Yes
Indiana Steel Company, Gary, Ind.....	Koppers 560 Yes	Tennessee Coal & Iron Company, Ensley, Ala.....	Semet-Solvay 240 Yes
Illinois Steel Company, Joliet, Ill.....	Koppers 280 Yes	Tennessee Coal & Iron Company, Fairfield, Ala.....	Koppers 280 Yes
Kentucky Solvay, Company, Ashland, Ky.....	Semet-Solvay 108 Yes	Toledo Furnace Company, Toledo, Ohio.....	Koppers 94 Yes
Lehigh Coke Company, So. Bethlehem, Pa.....	Didier 40 Yes	United Furnace Company, Canton, Ohio.....	Koppers 47 Yes
Lehigh Coke Company, So. Bethlehem, Pa.....	Koppers 424 Yes	Union By-Product Coke Company, Buffalo, N. Y.....	Roberts 66 Yes
Laclede Gas & Light Company, St. Louis, Mo.....	Koppers 56 Yes	Western States Coke Company, St. Paul, Minn.....	Koppers 55 Yes
LaBelle Iron Works, Follansbee, W. Va.....	Koppers 94 Yes	Wickwire Steel Company, Buffalo, N. Y.....	Semet-Solvay 60 Yes
Lackawanna Steel Company, Buffalo, N. Y.....	Otto 188 Yes	Woodward Iron Company, Woodward, Ala.....	Koppers 170 Yes
Lackawanna Steel Company, Buffalo, N. Y.....	Rothberg 280 Yes	Youngstown Sheet & Tube Company, Youngstown, Ohio.....	Koppers 204 Yes
Lackawanna Iron & Steel Company, Buffalo, N. Y.....	Otto 232 Yes	Zenith Furnace Company, Duluth, Minn.....	Otto 65 Yes
Maryland Steel Company, Sparrows Point, Md.....	Koppers 120 Yes		

pactive amount of these materials was inadequate, rather than to build a hydroelectric plant?

Private capital will in the future be just as ready to build ovens as it has been in the past. Then why has the Government got to spend \$15,000,000 to secure something private capital is producing now? If it feels it has to spend money, why not spend it on the sulphate of ammonia industry, where it will not only secure benzol and toluol for itself, but where during the 99 per cent of the time we are at peace all those working directly and indirectly in the many ramifications of the coal tar derivatives will also be benefited?

It was my good fortune two years ago to visit most of the by-product coke ovens in the Durham and Middleborough district in England, and a great many of the ovens in the triangle formed by Dusseldorf, Dort-

mund and Wesel, which is the lower Rhine-Westphalian steel district of Germany. After having seen just before I left the practice and mechanical refinements of the Gary plant, visiting the coke-oven operations in Europe brought back very vividly the practice here of 10 years ago. One realized how entirely we had gotten away from the old world's standard.

There were only two things that I saw where I considered they were in advance of us. One was a gas engine installation and the other the use of mixed gases. At one of the big German steel plants they have a 10,000-hp. installation of gas engines, generating electricity, which cost them complete \$300,000. That same installation over here would have cost \$1,000,000, which may explain why the large gas engine unit is less in vogue here than there.

The other instance was at Skinningrove, where Ernest Bury, who has contributed liberally to coke-oven

data, in a number of papers he has presented before various bodies in England, took us through his plant where he was using a mixture of three volumes of blast-furnace gas with one volume of coke-oven gas, and getting a mixture about as follows:

Hydrogen, 13.25; methane, 7.5; unsaturated hydrocarbons, 0.5; carbon monoxide, 22.75; carbon dioxide, 9, and nitrogen, 47 per cent, with a B.t.u. value per cu. ft. of 206.

He was using this gas in his gas engine to produce electricity; also in the open-hearth furnaces and in the soaking pits. These gases replaced producer gas of analysis about as follows:

Hydrogen, from 9 to 14; methane, 2 to 3.5; carbon monoxide, 22.28; carbon dioxide, 3 to 6; nitrogen, 55 to 60 per cent, with a B.t.u. value of 125 to 175.

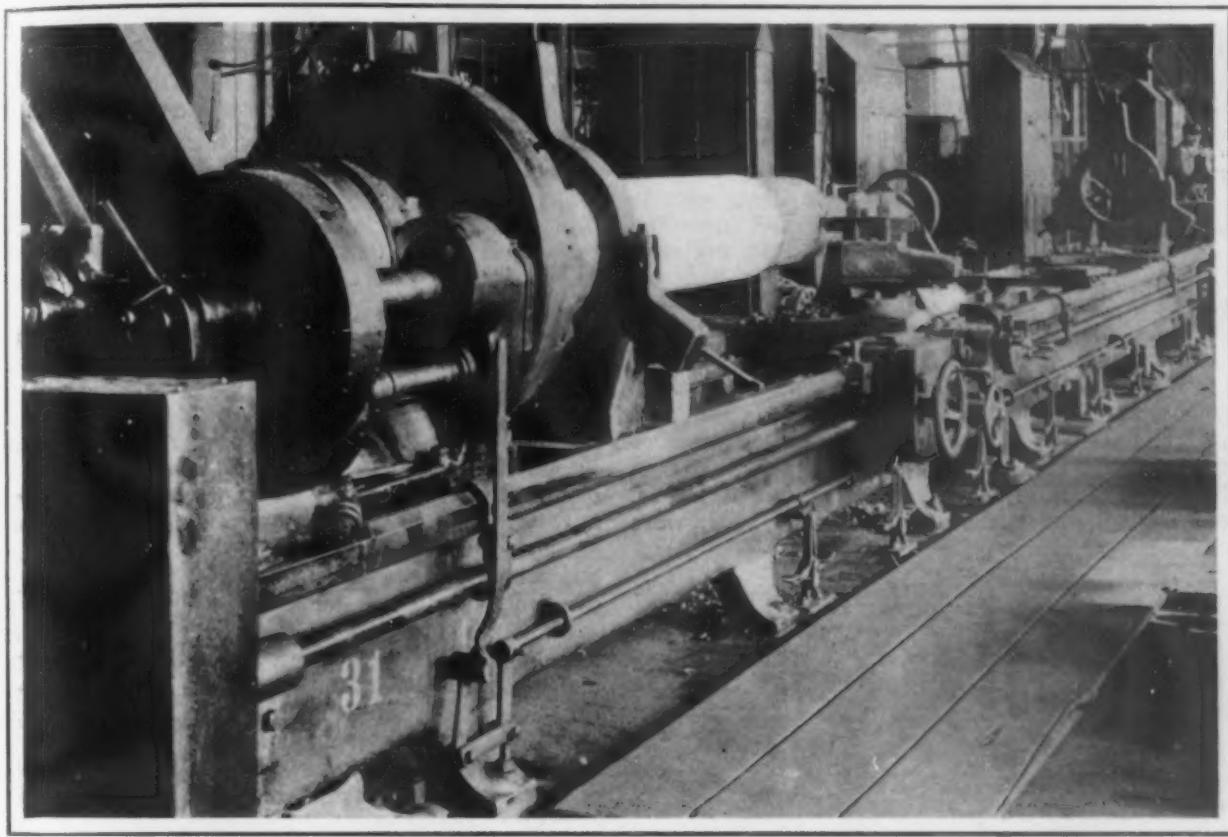
That we will come to use a mixture of this kind I am confident, especially as natural gas, which has been

so instrumental in building up the steel industry in Pennsylvania, is rapidly beginning to show signs that it cannot be counted on in the future as it has been in the past.

The advantage of the use of these gases is that a constant supply of a uniform composition and calorific

A Convenient Belt-Shifting Arrangement

The accompanying illustration reproduces a photograph taken in the mill machine shop at the South works of the Illinois Steel Company, and shows an unusually convenient device for shifting the belt of a



Foot Levers Spaced Along the Machine Provide Convenient Means for Shifting the Belt

value is always available. In the case of melting furnaces the cost per ton of ingot is less than that of producer gas, and there is no stand-by loss. No space is needed for fuel storage. There are no labor and repair costs, and constant supervision, in order to procure producer efficiency, is eliminated.

In good blast-furnace practice, where the gases are efficiently washed, they are using about 30 per cent of the total volume of the gas for stoves, 7.5 per cent for the boilers, and 12.5 per cent for blowing engines, and there is a 5 per cent loss in washing, etc., leaving a surplus of available gas of from 40 to 45 per cent. This gas has a value of between 90 and 100 B.t.u. The volume of gas depends, of course, on the amount of air that is being blown and what the charge is, but will amount in the case of a modern furnace to around 25,000,000 to 30,000,000 cu. ft. per day per furnace.

By mixing this low B.t.u. value gas with the richer coke oven gas, making an average of 200 to 250 B.t.u. per cubic foot mixture, an increased supply of calorifically uniform fuel gas is obtained, which undoubtedly is advantageous.

With the exception of these two things I can truthfully say that the European practice, excepting in ammonia and tar yields, is in no way comparable to the present United States practice, and in engineering and amount of production we are immeasurably superior to our instructors.

The changes that are occurring from day to day are so numerous, and may be so important, that one cannot help feeling that two years from now everything now said will be obsolete, excepting for the two principles involved, uniformity in the coke and regularity in the operation and in the temperatures of the ovens.

The eighth annual meeting of the American Institute of Chemical Engineers will be held in Cleveland, Ohio, June 14 to 17.

big lathe with a long bed. The shifter is on the far side of the lathe, and cannot be seen, but the interesting features are the 7-ft. levers, by means of any of which, or by the hand lever in the foreground, the belt may be thrown on or off the live pulley. The levers are spaced equidistantly the full length of the lathe bed. The levers are pivoted in a link at the bottom and swing either way from the vertical, the arc of travel being taken up by a link, at the top of which also actuates the horizontal shifter rod.

The United States Leading in Shipbuilding

American shipbuilding led the British industry in the first quarter of this year. In the three months ended March 31, 1916, American yards launched 173 merchant vessels of 94,464 gross tons, while British yards, according to Lloyd's returns, launched 69 merchant vessels of 80,561 tons. Merchant ships now building or under contract in American yards are approximating the British output for the future. In American yards 31 merchant vessels between 8000 and 12,000 gross tons are under contract against 26 in British yards; in American yards 77 between 5000 and 8000 tons against 68 in British yards; 39 between 3000 and 5000 tons in American against 74 in British yards and 44 vessels of 1000 to 3000 tons in American against 62 in British yards. British yards have 16 steamers over 12,000 gross tons against none in the United States. The total for American yards is 191 vessels of over 1000 gross tons against 246 in British yards.

The offices of the Co-operative Used Machinery Company are now located at room 482, 50 Church Street, New York City, and not room 408, 30 Church Street, as was announced in THE IRON AGE of May 4.

Alternating Stress Endurance of Steel*

Relations Between the Results of Fatigue and Other Tests—New Type of Alternating Stress Machine and Some of Its Results

BY DR. B. PARKER HAIGH

TESTS of the endurance of metals under alternating stresses have seldom been specified as proving tests and hardly seem likely ever to form part of the regular series of tests imposed by specification. Under present-day conditions they fall into the category of experimental research, chiefly on account of the delay which would be occasioned if deliveries were held back for the completion of lengthy fatigue tests.

With the knowledge at present available, it is impossible to anticipate the result of a fatigue test under alternating stress, from the proved values of the ultimate tensile or shear strength, or Brinell hardness. As an illustration of this, two materials, one a steel and the other a patented alloy, were

advances that have been made toward finding connections between the results of fatigue and other tests.

A large part of present knowledge of the endurance of metals under alternating stress has been gained from experience with completed structures, and particularly from the investigation of breakdowns that have occurred in practice. For evidence of such experience, scientifically analyzed, reference may be made to a paper on crankshaft failures, contributed by Dr. C. E. Stromeyer to the meeting of the Institute of Naval Architects held in March, 1915. In many instances, crankshafts made of sound material, possessing fair ductility, have failed in a brittle manner after longer or shorter periods of service. In some cases this has been due to bearings having been allowed to become overheated and then suddenly drenched with water so that cracks have developed owing to sudden and non-uniform contraction. In a larger number of instances cracks have developed from the fatigue of the metal, produced by the repeated application of a stress considerably less than the yield stress, and even below the accepted elastic limit of the metal.

Such cracks originate where the range of variation of stress is greatest, especially at fillets and other points at which the normal stress is exceeded on account of local influences. The calculation of the true stress at such localities is laborious and uncertain, and on this account it is difficult to apply the lessons gained from experience, or from laboratory experiments, in the design of new work. Nevertheless, reliable guidance can often be obtained without the exact calculation of the range of stress at the critical points of the shaft or other article in process of design. In particular, laboratory experiments afford an accurate means of comparing the endurances of different materials subjected to definite variations of stress.

The appearance of a fracture produced by fatigue is shown in Fig. 1, in contrast with the normal "cupped" fracture, Fig. 2, given by the same material (a Bessemer steel containing about 0.35 per cent carbon) tested under steady stress in an ordinary testing machine. The fracture shown in Fig. 1 is that of a test piece $\frac{1}{4}$ in. in diameter, and is typical of the form of fracture encountered in crankshafts, connecting rods and similar parts subjected to alternating stresses. The crack illustrated has originated at A and has spread across two-thirds of the area of the specimen, the remainder tearing away suddenly with ductile disturbance.

The face of the crack close to the origin is discolored by oxidation. This appears to be due to the action of nascent oxygen formed within the crevice when the crack is first developed. The crevice alternately opens and closes during each cycle of stress and the air within the crack, having no time to escape by the edges, is alternately compressed and expanded and simultaneously occluded and liberated by the metal itself. Each liberation of the gas generates a film of nascent oxygen, which combines with the metal, forming a skin of oxide. The

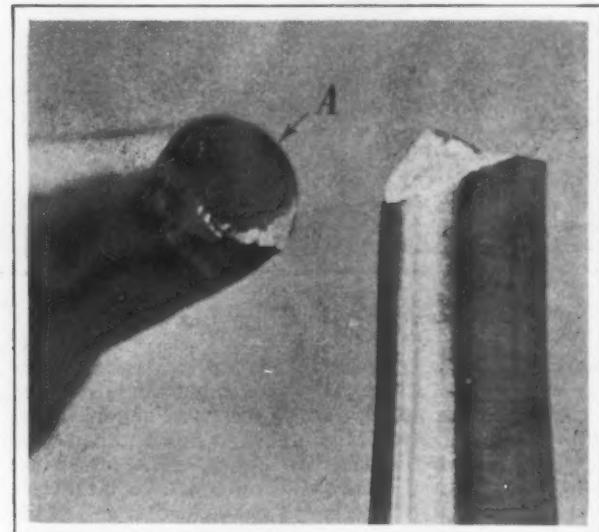


Fig. 1—Fracture of Bessemer Steel Under Alternating Stress
tested by the writer and were found to possess approximately identical ultimate strengths and elongations. They differed, however, in their resistance to alternating stress, fatigue commencing in the alloy when the range of stress was only one-half of that which was necessary to produce the same effect in the steel. This is an extreme case; but in the writer's experience the performance of steel, as regards resistance to fatigue, is generally better than that of alloys of comparable strength.

RELATION BETWEEN FATIGUE AND STATIC TESTS

By the accumulation and analysis of additional data, it may reasonably be hoped that a relation will eventually be found between the limiting range of stress above which fatigue is liable to occur, and the other physical properties of the metal; so that the fatigue limit may be deduced from the ordinary proving tests without carrying out lengthy tests under alternating stress.

It is the object of this paper to review a number of experiments on the endurance of metals subjected to alternations of stress, and to indicate the

*From a paper presented before the West of Scotland Iron and Steel Institute, Glasgow, and published in its *Journal*. The author is connected with the Royal Naval College, Greenwich, England.

same effect is met with in joints subjected to alternations of stress, the metal suffering corrosion; and if the joint be filled with oil, this may be decomposed and blackened by a corresponding action. The oxidation of the specimen occurs during a period lasting only a few seconds after the initial opening of the crack, for the crack develops rapidly although many millions of cycles of stress may have occurred before the metal became sufficiently fatigued for the crack to be formed. Exposure to ordinary air would not produce appreciable oxidation; in fact, the specimen shown had been so exposed for several hours before the photograph was taken.

STRENGTH AND MODULUS OF ELASTICITY

In the view of the writer, the continued development of amorphous material with each repetition of stress is to be attributed to the fact that the great strength of the amorphous material is associated with a low modulus of elasticity, while the weaker original metal possesses a comparatively high modulus. A number of tests, carried out by the writer, have shown that the modulus of elasticity of a specimen of annealed iron or mild steel is always reduced by straining in tension, provided that the effects of hysteresis are eliminated, either by allowing some time to elapse after straining before making the second determination of the modulus or, preferably, by boiling the specimen in water for a few minutes, as first carried out by Dr. James Muir.

That the modulus of elasticity plays a great part in controlling the development of the crack is indicated by the specimen shown in Fig. 3, a sample of wrought iron containing occasional reeds of slag possessing a low modulus. One of these reeds is seen running axially along the specimen, and it will be noticed that a number of cracks have started at the reed, running through the ferrite in planes perpendicular to the axis of the specimen. The cracks are not continuous across the reed, showing that they have not originated within the slag itself, but at the surface between the slag and the metal. As the modulus of elasticity of the slag is low, the adjacent metal has taken up an unduly large share

of the load and has quickly become fatigued, although the average stress is considerably less than the normal fatigue limit in good wrought iron. The

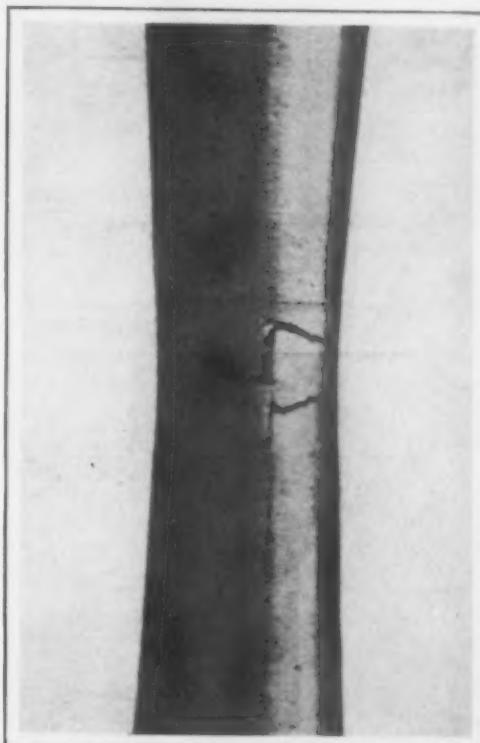


Fig. 3—Cracks in Swedish Iron with Reed of Slag

presence of slag is in general very undesirable in steel subjected to alternating stresses.

ALTERNATING STRESS TESTING MACHINES

The testing machines used in researches with alternating stress differ chiefly in the kind of stress applied, *i. e.* alternations of direct tension and compression, torsion, plane bending and rotary bending.

Rotary bending machines have been used by Woehler, Sir Benjamin Baker and by several later investigators. Plane bending machines have been devised by Woehler, Captain Sankey and by Professor Arnold. Captain Sankey's machine is particularly intended for straining specimens beyond the yield point, no endeavor being made to determine the fatigue limit. Woehler's machines operated with only a low frequency, about 60 per minute, and would hardly be used to-day on account of the time required to complete a test. Nevertheless his work, which covered some 12 years and was continued by Bauschinger and by Spangenburg, yielded a great deal of information and formed for many years, with Sir Benjamin Baker's investigations, the only record of experiments with alternating stresses.

To enable higher frequencies to be employed, and thus reduce the time required to carry out a test, a machine using the force of inertia to produce the load on the specimen was designed by Prof. Osborne Reynolds. In another high speed machine, designed by Prof. B. Hopkinson, inertia forces are used to develop the stress applied to the specimen, but are generated with trifling expenditure of energy by means of mechanical resonance.

A NEW MACHINE

The chief difficulty in designing an alternating stress testing machine lies in measuring its intensity. A large alternating stress testing machine, designed by the writer and installed in the engi-



Fig. 2—Fracture of Bessemer Steel Under Steady Stress

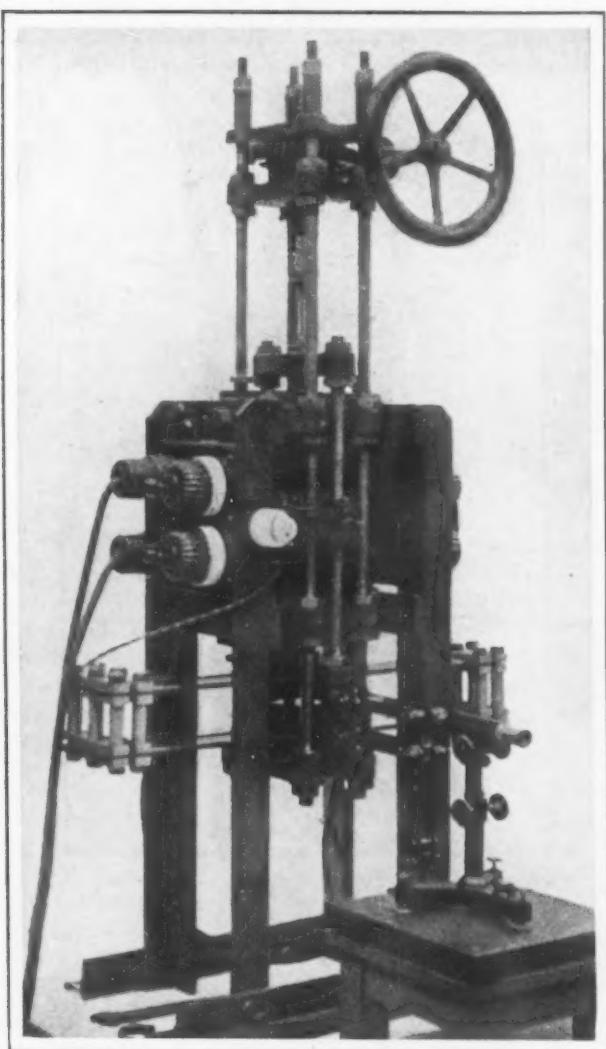


Fig. 4—New Type of Alternating Stress Testing Machine

neering laboratory of the Royal Naval College, Greenwich, operates on the same principle as a small wire testing machine, but is fitted with two-phase magnets so that specimens may be tested under stresses ranging between equal intensities of tension and compression. Provision is also made for testing specimens under combined stresses, an alternating stress being then applied simultaneously with a steady load of tension or compression.

The complete machine is shown in Fig. 4 and its diagrammatic arrangement in Fig. 5. The two magnets M_1 and M_2 alternately attract the armature A upward and downward respectively, the pull of the one being at its maximum when the pull of the other is zero. The armature is coupled to the lower end of the specimen S , of which the upper end is held in an adjustable fitting attached to the framework which carries the magnets.

The inertia force required for the acceleration of the armature is provided by a spring CS connected between the armature and the frame, and adjustable in stiffness according to the frequency at which it is desired to carry out a test. By extending or compressing this spring, the specimen is subjected to a steady load of tension or compression, in addition to the alternating stress produced by the magnets. In operating the machine, the position of the upper end of the specimen is adjusted so that the air gaps between the armature and the two magnets are equal, this being indicated when the currents taken by the two magnets are the same. The pull is measured by the voltages induced in secondary coils wound close to the pole-

faces, the machine being standardized in a special manner by means of a cylindrical phosphor-bronze specimen fitted with an extensometer.

The cyclical variation of the load on the specimen may be studied by watching the vibration of the index levers of the extensometer, a stroboscopic disc being interposed between the vibrating index levers and the objective of the microscope. The disc used had four slots and was rotated by a small four pole induction motor supplied with alternating current from the mains feeding the magnets. Rotating with a slight slip, i. e. slightly below synchronous speed, the disc showed the vibration of the index arms as if that occurred at a low frequency instead of at the real frequency of 2000 per minute. The movement was found to be very approximately simple harmonic, showing that the stress applied to the specimen varied in a sine wave, without appreciable harmonics.

THE TEST SPECIMEN

The form of the specimens used in tests made in this machine is shown in Fig. 6. A plain cylindrical specimen is naturally to be avoided for endurance tests, since fatigue would inevitably commence at the ends, the stress there being greater than the average value, calculated from the measured diameter. The actual specimens used were turned with short cylindrical portions about $\frac{1}{2}$ in. in length, at the mid part of their lengths, and were tapered toward the ends, with gradual transition curves between the conical and cylindrical portions. By adopting this form it was practicable to measure the diameter accurately; and as almost all specimens fractured within the cylindrical portions of their length, the value of the stress calculated for that section could be taken as that which had produced fatigue. Precautions were taken in gripping the specimens (which had screwed ends) to insure that no initial stresses, either of torsion or bending, were applied in tightening up the locknuts.

The machine described above has been in use in the engineering laboratory of the Royal Naval College, Greenwich, for some time past, and has been used by the author in connection with several researches on steels and alloys.

TESTS ON SWEDISH WROUGHT IRON

As the results obtained in some experiments with a steel of fair quality were somewhat inconsistent among themselves, an investigation was carried out to ascertain to what degree the endurance of the metal was affected by cold working and by heat treatment. Swedish wrought iron was employed in these tests in order to isolate ferrite, the chief constituent of mild steel. The metal used was of good quality, rolled in $\frac{1}{2}$ -in. bars, and was annealed before making the tests, although tensile experiments showed that the effect of annealing was only slight.

Yield stress, tons per sq. in.....	11.8
Ultimate strength, tons per sq. in.....	19.4
Elongation, on 21 diameters, per cent.....	20.3

The fracture was somewhat cup-shaped, indicating freedom from slag, and this was further shown by microscopic examination. The structure of the metal was almost entirely ferrite, with small and finely divided particles of slag.

Three series of tests were carried out with alternating stresses in order to compare the effects of the following treatments. In each series of experiments the stress varied between equal intensities of tension and compression, and the frequency was maintained at 2000 cycles per minute.

No treatment—annealed metal.

Similar specimens strained by direct tension, the load being regulated in each case so that the elongation was the same, 10 per cent. It was not found that the load required varied.

Similar specimens, strained in the same manner and subsequently boiled in water at 100 deg. C. for 30 min. to restore elasticity. This third treatment was tried on the strength of a suggestion made by Prof. J. D. Cormack, at a meeting of the Institution of Mechanical Engineers, 1912.

It was found that the results of each set were highly consistent among themselves, but that the fatigue limits indicated by the three differed appreciably. The endurance was considerably increased when the metal had been strained and was further increased when the strained metal had been boiled.

Under stresses sufficient to produce fracture with less than, say, 100,000 cycles at 2000 per minute, appreciable warming was observable in the case of each set of specimens. Thus the sense of touch serves to indicate the range of stress at which to begin any such series of experiments.

TESTS OF STRUCTURAL STEELS

To show the variations that occur in ordinary qualities of steel used in structural and mechanical

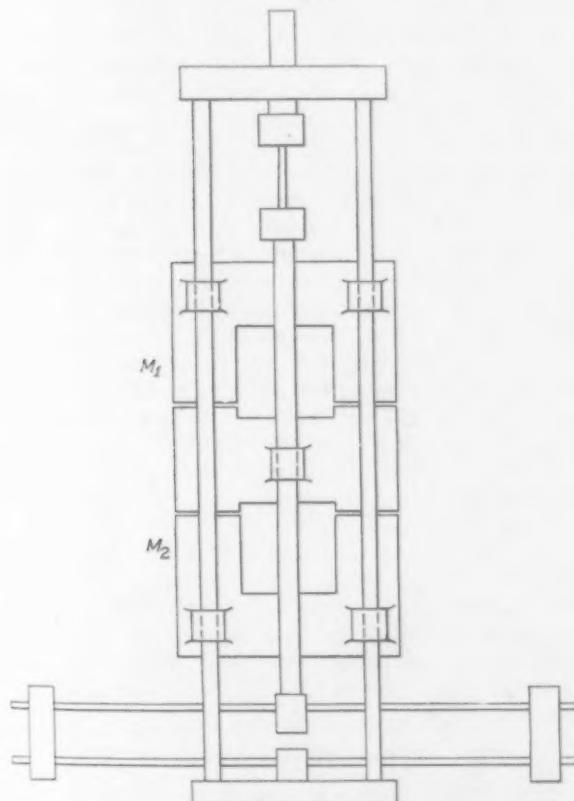


Fig. 5.—Diagram of Alternating Stress Testing Machine Shown in Fig. 4

practice, tests of two samples may be quoted, the one a mild steel and the other a stronger Bessemer steel containing about 0.35 per cent carbon. The metals were tested in the condition in which they were received without being annealed, so that results may be taken as applicable to practice. They may be summarized as follows:

Material	Mild Steel	Bessemer Steel
Yield stress, tons per sq. in.....	22.8	36.5
Ultimate strength, tons per sq. in.....	28.7	42.7
Elongation on 20 diameters, per cent....	24.4	15.4
Reduction of area, per cent.....	73	48
Limiting fatigue range, tons per sq. in.	35.5	35.0
Ratio, semi-fatigue limit to ultimate strength	0.62	0.410

It is remarkable that the fatigue limits of the two metals should be so nearly alike, although the tensile strengths and yield strengths differ so widely. The value of the ratio between the fatigue limit and ultimate strength varies widely, and without further data than has yet been collected, the author finds it difficult to suggest any relation between the two strengths.

It is probable that the effects of other elements than carbon present in the metal are important, and

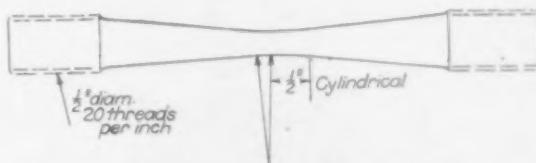


Fig. 6.—Specimen Used for Alternating Stress Test

Dr. Stromeyer has suggested nitrogen as particularly deleterious. In the view of the author it is desirable to accompany fatigue tests with very accurate measurements of the modulus of elasticity of the specimen. It is probable that impurities exert their harmful influence by dissolving in the ferrite and thereby increasing its hardness, at the same time changing the modulus of elasticity so that cleavage between ferrite and cementite occurs more readily under a given average stress. It would not appear, however, that elasticity could be used by itself as a criterion toward the fatigue limit, and, in fact, experiments made by the author show that the value of the modulus cannot be so employed even when measured with reliable apparatus. The sensitive measurement of the modulus is, however, a matter requiring delicacy of manipulation and would be difficult to accept as a regular proving test.

The rise of temperature met with in Bessemer steel when the range stress exceeds the fatigue limit appears greater than in mild steel, and this may be due to shearing proceeding between the laminae of pearlite instead of between the opposite faces of slip bands in the ferrite. If this is the case it might be anticipated that an improvement in the fatigue limit could be attained by changing the modulus of the ferrite so that its value approached that of the cementite present in the pearlite. It is well known that specimens of steel containing considerable percentages of carbon cannot, after being strained, be restored to an elastic condition by being merely boiled for a few minutes. Recovery of elasticity proceeds much more slowly, suggesting that the mechanism of strain differs from that in mild steel. The subject appears to be one that can only be solved by the accumulation of further data.

MILD STEEL UNDER COMBINED ALTERNATING AND STEADY STRESS

The material employed in this research was supplied as "dead mild" steel, in the form of 9/16-in. rolled bar. It was not annealed before testing, but was used in the condition in which it was received from the rolling mill. The results of tensile and Brinell hardness tests are summarized in the following table:

Diameter of specimen, in.....	0.374
Elastic limit, tons per sq. in.....	18.3
Yield stress, tons per sq. in.....	21.0
Ultimate strength, tons per sq. in.....	25.2
Elongation on 8 in., per cent.....	20.5
Reduction of area, per cent.....	71.4
Brinell hardness number, tons per sq. in.....	66.0

The Brinell test was made by means of a standard 10 mm. ball pressed upon a plane surface with the standard load of 3000 kg.

For Co-operation by American Exporters

Federal Trade Commission Formally Asks Congress to Pass a Law Permitting Our Manufacturers to Combine to Extend Exports

WASHINGTON, D. C., May 9, 1916.—The immediate clarification of the Sherman anti-trust law and all laws supplementary thereto by the enactment of a declaratory amendment specifically permitting American business men to combine for the extension of export trade, employing "any methods of organization which do not operate to the prejudice of the American public and are lawful in the countries where the trade is to be carried on" is urged upon Congress in a report which has just been forwarded to the Senate by the Federal Trade Commission.

The commission's report has been made in response to a resolution of the Senate adopted soon after the commission was created directing an exhaustive investigation of the question of foreign competition and an expression of opinion as to the necessity and propriety of amending the existing anti-trust laws. The commission finds: "First, that other nations enjoy marked advantages in foreign trade from superior facilities and more effective organizations; and second, that doubt and fear as to legal restrictions prevent Americans from developing equally effective organizations for overseas business and that the foreign trade of our manufacturers and producers, particularly the smaller concerns, suffers in consequence."

ADVANTAGES OF FOREIGN EXPORTERS

The commission in its report enumerates many of the advantages enjoyed by foreign exporters including transportation, banking and credit facilities, and the far-reaching influence of the investment of foreign capital in those countries presenting the most inviting neutral markets. The heaviest handicap encountered by American manufacturers seeking business abroad is the aggressive competition of powerful foreign combinations often international in character. In Germany, England, France, Italy, Austria-Hungary, Switzerland, Holland, Sweden, Belgium, Japan and other countries business men are much freer to co-operate and combine than in the United States. In Germany prior to the war there were 600 important cartels, i.e., combinations to control the market, embracing practically every industry in the Empire. Many dominated the export trade of their industries and carried on vigorous campaigns to extend their foreign business, to prevent competition among German producers in foreign markets and to secure profitable prices. The manufacture and exportation of electrical equipment has been made one of the bulwarks of German foreign trade by two great companies, the Allgemeine Electricitäts Gesellschaft and the Siemens-Schuckert, with numerous subsidiaries at home and abroad working in harmony with each other. Half of the \$150,000,000 worth of coal and coke exported annually was sold by one central selling agency, maintained by the great Rheinisch-Westfälische coal syndicate, of which the Prussian Government mines are members, and which embraces the bulk of all the coal and coke production of the Empire. Practically all the rapidly increasing and highly valuable iron and steel export business was handled by the single selling agency, the Stahlwerks Verband, the aggressive union of German iron and steel manufacturers which has active-

ly fostered foreign business through export bounties and other means.

In France and Belgium syndicates of iron and steel, coal, glass and other industries were strong factors in domestic and foreign trade. In Italy, Russia, Austria-Hungary, Switzerland, Sweden, Greece, Argentina, Chile and Ecuador central organizations unite the interests of producers in various industries such as coal, iron and steel, agricultural machinery, oil, sulphur, superphosphates, cement, etc.

In Japan one great firm, which in itself combines manufacturing, mining, shipping and merchandising enterprises, is rapidly extending Japanese trade in all lines throughout the Far East, and the Japanese Government is directly assisting the development of shipping, banking, and trading for foreign business.

British manufacturers have relied more fully upon an unusually effective merchandising organization for foreign trade, long established in foreign markets and giving British products a superior representation there, but in various important industries they have gone much further. Thus, most of the great coal export business is done by powerful organizations, combining mine operators, marketing companies, shipping lines, and foreign distributing companies. This gives British coal its grip on the rich South American market. British cement manufacturers are united in a strong and successful union for the extension of their overseas trade. Recently a number of large British manufacturers of machinery of all sorts have formed the Representation for British Manufacturers, Ltd., an organization to handle all their business in certain important foreign markets and to carry on an aggressive campaign for its extension. In the electrical, iron and steel, and various other industries strong associations and combinations are important factors in foreign and domestic business.

It is against such organizations as these, uniting powerful groups of foreign concerns, backed by great banks, aided by railroad and ship lines and vigorously assisted by foreign governments that hundreds of comparatively small American manufacturers and producers must compete for trade beyond our shores.

FOREIGN BUYERS DEPRESS AMERICAN PRICES

In various markets American manufacturers and producers must deal with highly effective combinations of foreign buyers. The Wholesale Co-operative Societies, Ltd., an astonishingly comprehensive wholesale buying organization maintained by 1400 co-operative societies in Great Britain, has one buyer in New York who annually purchases millions of dollars' worth of American products. Combinations of British coal brokers fix the contract price for bunkering ships at Newport News. Four London firms, known as the Fixing Board, daily set the price of silver for the world, and American mining companies must sell their silver for either the English or the great Indian market to one of these four houses. For years the copper trade of the world has been ruled by a vast German metal-buying organization centering in the Metallbank und Metal-

burgische Gesellschaft A. G. of Frankfort on the Main. This combination has subsidiary and affiliated companies in Germany, England, France, Spain, Switzerland, Belgium, Africa and Australia, controls copper and lead mines and smelters in the United States, Mexico and other countries, and works in agreement with other German metal-buying concerns.

These combinations constantly make individual American producers bid against each other, and are thus able to buy at prices near or below the cost of production. By such tactics the present contract price for bunkering ships in Hampton Roads has been fixed at 5c. to 7c. per ton below the domestic price. By similar means and the manipulation of the foreign future markets the German metal buying combination over a series of years has bought millions of tons of American copper at prices averaging nearly a cent a pound below the prices paid by American consumers.

OUR MANUFACTURERS NEED TO WORK TOGETHER

If Americans are to enter the markets of the world on equal terms with their organized competitors and their organized customers, they must be free to unite their efforts. We are in danger of being misled into over-confidence and baseless self-assurance by the imposing totals of our present abnormal foreign trade. A great part of our present trade is purely war business which will end with peace. Another part is enforced buying by parties cut off from former sources of supply, and unfortunately much of this business is being done on terms and by methods that are alienating the purchasers and that insure the diversion of their trade to other countries at the earliest opportunity. Moreover, the end of the war will doubtless see vigorous efforts by Europeans to recapture lost trade. Therefore, the commission believes earnest thought should be given to measures for the improvement of our foreign business, and the immediate amendment of the anti-trust laws is therefore urged.

The commission calls attention to two chief dangers from co-operative export organizations of American manufacturers and producers. They may be used to exploit the home market and they may be employed unfairly against individual American exporters in foreign trade. These dangers, the commission declares, must be faced frankly and provided against fully; but confidence is expressed that this can be done without sacrificing the essential advantages of joint action and without altering the policy of the anti-trust laws or interfering with their enforcement. Thus specific extension of the law prohibiting unfair methods of competition to export trade and requirement of full reports to the Federal Trade Commission from co-operative export organizations will protect the individual exporter, while the enforcement of the anti-trust laws will prevent the use of such organizations to effect restraint of trade or monopoly in the domestic market.

W. L. C.

As a tribute to employees who have been with the company from its beginning the Goodyear Tire & Rubber Company, Akron, Ohio, has built an eight-story tower to be known as Old Guard tower. On the top floor a mammoth clock with four dials has been installed. The tower stands on the site of an old mill which for many years has been a landmark. The Old Guard is composed of employees who were in the employ of the company when the present factory manager, P. W. Litchfield, took charge nearly sixteen years ago. Among the number is President F. A. Seiberling. It is expected that they will hold their annual dinners in the observation room of the tower.

Large Gains by Allis-Chalmers

The report for the year ended Dec. 31, 1915, of the Allis-Chalmers Mfg. Company shows a splendid increase in net profits, more than sufficient to pay a 6 per cent dividend on the preferred stock, as compared with a deficit the year previous. A substantial improvement in surplus is also shown. The income account compares as follows:

	1915	1914
Sales billed	\$11,666,413	\$10,323,150
Operating charges, including depreciation	9,582,264	9,221,174
Factory profit	\$2,084,149	\$1,101,976
Administrative and general expenses	1,353,054	1,379,685
Net manufacturing profit	\$731,095	\$277,709
Other income	347,258	252,640
Net profit	<u>\$1,078,352</u>	<u>*\$25,068</u>
*Deficit.		

The condensed balance sheet is as follows:

	Assets	1915
Real estate, plant, etc.,	\$11,021,711	
Patents, good-will, etc.	19,615,805	
Allis-Chalmers voting trust certificates	406,135	
Notes and accounts receivable	3,919,966	
Inventory	4,902,277	
Securities owned	3,580,105	
Cash	1,123,095	
Bullock electric bonds	873,411	
Deferred charges	72,289	
Total	<u>\$45,514,771</u>	
	Liabilities	
Preferred stock issued	\$16,500,000	
Common stock issued	26,000,000	
Accounts payable	429,537	
Allowances to complete contracts	313,319	
Pay roll accrued	199,485	
Taxes accrued	129,458	
Reserves	134,564	
Profit and loss surplus	1,332,924	
Total	<u>\$45,514,771</u>	

In his remarks to stockholders, Otto H. Falk, president, says:

In accordance with the policy of the company liberal charges for reserves, maintenance and depreciation are included in operating costs. The total amount for depreciation of property during the year was \$364,837, and \$528,128 was expended for maintenance, repairs, upkeep of plants and equipment, which are now in better condition than ever before for economical production.

To keep up and enlarge the present lines of manufacture and to provide for new lines, the amount of \$231,452 was expended for standard development and charged to cost of manufacture. On December 31, 1914, the unfilled orders amounted to \$2,503,937 and on December 31, 1915, to \$1,040,683. The unfilled orders on hand March 31, 1916, were \$12,063,000. Of this amount over 80 per cent, or approximately \$10,000,000, consisted of orders for machinery and manufactures of the regular and standard lines of the company.

Grayson M. P. Murphy, vice-president Guaranty Trust Company, and Charles P. Pfister, both of Milwaukee, were elected directors to fill vacancies caused by resignations of Colonel Pabst and William C. Potter, who had previously resigned. Other directors were re-elected.

Imports of Ferromanganese Increasing

Imports of British ferromanganese to the United States in March, according to Government data, were 7112 gross tons, against 6892 tons in February and 5397 tons in January, making a total for the first quarter of 19,401 tons. Imports in the first quarter of 1915 were only 548 tons, the British embargo being then in effect. The average per month to April 1, 1916, was 6467 tons comparing with only 4600 tons per month for the year 1915. Of the March imports of 7112 tons, 4399 tons came through the port of Baltimore, 1425 tons through Philadelphia, 993 tons through New Orleans and 295 tons through Norfolk, Va.

The Century Steel Company of America, Inc., is now located in offices at 120 Broadway, New York. The company has warehouses at 191 Pearl Street, New York, and at the foot of Twenty-fourth Street, Brooklyn, N. Y.

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Steel Capacity and Labor Supply

Four months ago the annual summary of THE IRON AGE showed new steel works capacity in course of erection or definitely planned amounting to 4,265,000 tons annually of steel ingots. In recent weeks the question whether the labor supply would permit the steel industry to operate continuously at full capacity has become a still more serious one. It might be inferred that as a steel works or a steel works addition is completed, the completion would release men to an extent easily balancing the labor required to operate it, but this is all a question of proportion, depending upon how rapidly the work of construction has been carried on. The work does not seem to have been progressing very rapidly. Since the first of the year quite a number of new steel works additions have been projected. It is doubtful whether the additions completed have balanced the fresh additions projected. It is quite possible the new capacity now in course or definitely projected is equal to the 4,265,000 tons ingot capacity found at the beginning of the year. At any rate it seems quite certain that the completion of steel works additions will not release men at any great rate, particularly since the work of construction has been proceeding slowly. There is an interesting illustration at Gary. Our summary at the first of the year credited Gary with having under erection a duplexing steel plant of two 25-ton converters and two large tilting open-hearth furnaces, but since then the Steel Corporation has decided to build at Gary a complete Bessemer steel plant in connection with the National Tube Company. The latter plant will require many more men in construction than the former.

Thus the steel industry promises to continue requiring more and more men month by month, whereas the supply of men is not increasing to any extent. The immigration statistics have become less unsatisfactory, but the population is being increased at only a very slow rate by this influence. In the two years prior to the war the population of the United States increased, by the excess of persons entering over persons leaving, by an average of 60,000 a month. In the fiscal year ended June 30, 1915, the increase was only 50,000. In the next seven months it was only 11,000. Then the statistics began to be less unfavorable, in that February showed a population increase of 18,000 and March an increase of 29,000, but even the March increase

is a shade less than one-half what may be taken as normal, and March is only one month.

From the slow rate at which new steel works construction is being completed, and the large amount that it is desired to prosecute, it would appear that whatever the scarcity of labor is at present the prospects are the situation will be made more tense while the war lasts.

Export Co-operation Without Crime

Manufacturers now have a rare opportunity—that of working for a constructive piece of legislation. Usually their rôle at Washington is protesting against some legislative proposal likely to do them harm.

For more than two years co-operation to increase export trade has been a slogan of American business men. At the St. Louis and the New Orleans conventions of the Foreign Trade Council men of all political opinions agreed that this is one of the most vital issues in the whole export movement. The agitation for an act of Congress legalizing combined effort in export fields has now taken shape in a bill that is to come before the Senate. For months the Federal Trade Commission has been investigating competitive conditions affecting Americans in international trade. It has found that one important reason for the success of European manufacturers in foreign markets is their superior organization. American manufacturers find that foreign makers often undersell them here because of syndicate agreements such as Germany has, under which prices are maintained at home while special low prices are made on exports. It is also found that foreign buyers of some American products are able at times to buy these products to better advantage than consumers here. Combined action of foreign buyers and independent action of American producers have enabled the former to hold aloof in a dull market until some anxious American seller cut the price. This has happened in copper not once nor twice.

The upshot of the Trade Commission's report, just sent to the Senate, is a unanimous recommendation that American business men be allowed to use the same weapons which foreign manufacturers have long employed. What the best minds in Europe have approved, our manufacturers can now only attempt under peril of being put on trial as law breakers. The commission is fully con-

vinced that it is not fair to subject American manufacturers to the competition of European syndicates and then deny them the right of self-defense.

Foreign trade extension is no partisan matter. The fruits of an increase in our overseas commerce will be reaped not only by manufacturers but by the transportation, farming, banking, mining, jobbing and retail merchant interests of the whole country. Home trade can only be affected favorably by the proposed permission to combine on exports. The Senate bill is particularly in the interest of smaller concerns, since the largest manufacturers have export organizations of their own. Business men should promptly ask their Senators and Representatives to make into law this first legislative recommendation of the Federal Trade Commission. It is a piece of real preparedness for the fiercer world trade struggle into which our manufacturers will be thrust on the ending of the war.

Exports of Steel and Manufactures

When the volume of steel involved in our present export trade is overestimated, as it not infrequently is, the error is usually in assigning too much steel to the manufactures exported, the steel now commonly designated as "indirect exports." It is therefore well to point out that as a matter of fact our iron and steel exports are divided about the same as formerly into direct tonnage exports and exports of manufactures which involve the use of steel. This preservation of the ante-bellum proportions is due to certain coincidences. For instance, exports of certain classes of machinery have increased very sharply, while other machinery exports have fallen off.

In the eight months ended February the exports of iron and steel commodities that are returned by weight totaled 2,963,855 gross tons, as shown by the detailed statement in THE IRON AGE, April 20, page 948. The stated value of these exports was 36 per cent of the total value of iron and steel exports, which was \$355,120,855, leaving 64 per cent to represent the value of the non-tonnage iron and steel exports. In the five years prior to 1914 the average proportion of the tonnage value was 34.9 per cent, the proportion varying from 31.4 per cent in 1910 to 39 in 1912. In 1900 the proportion was 32.8 per cent. Thus, if anything, the non-tonnage exports are in a smaller, and the tonnage exports in a larger, proportion than formerly, although the divergence is practically negligible.

The exports of manufactures involving more or less steel consumption in their production, but not returned by the Government in the category of "iron and steel," are, however, somewhat larger than formerly. Before scrutinizing these items it may be of interest to present a broad classification of the exports that are reported as "iron and steel."

There are, first, the tonnage items, including scrap, pig iron, unfinished steel, rolled steel, cast and wrought pipe, wire nails, plain wire, barb wire, bolts and nuts, horseshoes, etc., amounting in weight in the eight months ended last February to 2,963,855 gross tons and in stated value to \$127,892,153. Next there is "machinery," including a wide range of products. Then there are various miscellaneous classifications, thirteen in all, as follows, named in the order of their importance: firearms, tools, wire

manufactures except fence and plain and barb wire and nails, hardware, railroad track material, cutlery, castings, stoves and ranges, enameled ware, scales and balances, carwheels, woven wire fence and safes. These we denominate "miscellaneous manufactures" in the table below. Finally, the Government has an item "all other," which heretofore has been unimportant, usually running between \$1,000,000 and \$2,000,000 a month, but now grown very important because unloaded shells are included in it. The distribution as to value in the eight months ended last February is as follows:

Tonnage items	\$127,892,153
Machinery	106,389,447
Miscellaneous manufactures	40,556,677
All other	80,282,578
Total iron and steel	\$355,120,855

Ten per cent of the total tonnage reported was comprised in the three items, scrap, pig iron and bar iron, low priced commodities. There was a considerable tonnage in cast pipe, as well as much in other items far from high priced. When the value of these tonnage items constituted 36 per cent of the total value of all iron and steel, including valuable machinery, firearms, cutlery, shells made under rigid specifications, and other high priced commodities, it is obvious that the steel used in making the other 64 per cent of iron and steel exported was but a fraction of the tonnage represented in the exports returned by weight.

Manufactures returned under other categories than "iron and steel" yet involving considerable iron and steel in their manufacture, make a fair total, but these exports are not all due to the war by any means. The exports of agricultural implements, for instance, have decreased, having amounted to \$20,831,505 in the eight months ended February, 1914, and to \$9,185,859 in the eight months ended last February. The exports of automobiles and freight cars, on the other hand, have increased greatly, and these exports are probably almost exclusively caused by the war, the exports that would otherwise occur having been very largely discontinued. Substantially all the exports involving any considerable quantity of iron and steel have been as follows, in the eight months ended last February:

Agricultural implements	\$9,185,859
Aeroplanes and parts	5,162,207
Commercial automobiles (14,467)	38,729,721
Passenger automobiles (33,256)	25,534,507
Automobile parts, except engines and tires	14,965,360
Carriages	61,165
Railroad cars and parts	16,571,767
Bicycles, tricycles, etc.	490,580
Motorcycles	2,125,230
Wagons	825,871
Wheelbarrows, etc.	185,567
All other vehicles and parts	5,880,968
Shells, etc.	117,558,614
Total	\$237,277,416

The item given above as "shells, etc.," appears in the Government statistics under explosives as "all other," the explosives specifically mentioned being cartridges, dynamite and gunpowder.

From the data given it is evident that the iron and steel exports that are reported by weight involve a considerably larger tonnage of steel than is consumed in producing the manufactures that are exported. The great bulk of the steel being produced is being consumed at home. The war has

made consumers of steel very prosperous. Whether they would have become prosperous by this time if no war had occurred is of course a subject that could be discussed without end.

Working Forces Overlooked

For some considerable time the news of the day has been punctuated by announcements of advances made in the wages of workmen. More frequently than otherwise, as it happens, these advances have been made voluntarily by employers. A feature of such announcements has almost invariably been that they did not include salaried employees.

The expression "salaried employees" is applied to a rather large contingent of working forces. It not only takes in officers of a company, but applies to bookkeepers, timekeepers, stenographers and those doing general clerical work. This is a division of the employees of an establishment in which it must be admitted that the compensation paid is not by any means on an equivalent with that of skilled labor in any of the manufacturing departments. The training which comes from a school or collegiate course is apparently not considered as valuable as that which gives a mechanic his manual dexterity. Office forces are further not connected with any kind of a union organization. The emoluments given to a clerk are fixed arbitrarily, and usually the employee has little to say regarding the rate he receives or should receive. He is generally paid as small a salary as it is found will secure his services.

In this period of high cost of living, of great activity in business, and of general advances in wages, it would seem that the clerical forces should not be overlooked, but that they should also be permitted to share to some extent in the general betterment. Their services are undoubtedly of some value or they would not be employed. Hence, at a time like this their services should be considered as a little more valuable than in times of either ordinary demand or actual depression. It would be interesting to know in how many manufacturing establishments the clerical forces are now receiving no greater salaries than a year and a half ago when business was depressed.

Wages in Government Shops

The Secretary of War recently announced a peculiar theory with regard to the rate of wages that should prevail in Government workshops. He states that in his opinion the Government should pay better wages and offer better working conditions than obtain in private establishments. The Government should do this to secure "the pick of employees and be a model to private employers."

The policy of the Government has hitherto been to pay the prevailing rate of wages in the vicinity in which the various workshops are located. It has apparently had little difficulty in attracting the best class of workmen into its shops on these terms, as the easier hours, more frequent vacations and generally less stringent rules, as well as the prestige of being attached to the Government service, have powerfully served to draw men into such establishments from private shops. It does not ap-

pear to have been necessary to offer higher wages either per diem or per hour to secure the pick of men. So far as this feature of the question is concerned, Secretary Baker hardly seems warranted in taking the view to which he has given utterance. The Government, however, could very well undertake, if it has not already done so, to make its shops a model to private employers in other respects than in the wages paid.

If Secretary Baker's idea as to wages were to be carried into practice, it would seem that the effort to maintain a higher rate of wages than those prevailing in private shops would unsettle labor conditions in the localities in which such shops are situated. It is hardly to be presumed that workmen in the private shops would be contented if their wages were not equal to those paid in the Government shops, and a constant source of irritation would thus exist. For instance, if the private shops, under compulsion from their workmen, should raise wages to the level paid in the Government shop in their vicinity, the Government would then be obliged, in carrying out this scheme of Secretary Baker, to advance the wages of its workmen to another higher level. How this condition of affairs would ever become settled it is difficult to say. Possibly Secretary Baker may have in mind the possibility that the Government might be able to regulate wage scales. This, if it were practicable, would seem to be the only way in which to bring about such a state of affairs as that which he suggests.

CORRESPONDENCE

No Compulsory Metric System

To the Editor: There seems to be no real call for legislation to have the binary system superseded by the metric system. The latter is already optional, having been legalized in 1866. So far its most useful field has been in connection with exporting; its domestic use is very slight. It is certain that if export conditions had not demanded it, no amount of legislating would have made it a success. So in the United States its growth should be natural. If it is the better system, it will eventually become universal without compulsory legislation.

To advance the proposition that because we use the metric system for export purposes we should be compelled to use it at home is to argue that because we quote a customer in pounds or marks or francs our currency should be revised to correspond. At the same time, the manufacturers, in their zeal to prevent compulsion, are magnifying the objections to the system itself. In the manufacture of a great many articles it is neither difficult nor expensive to supply the customer with what he desires. In the plant where the writer is employed, the gages and tools are made to metric measurement and the parts are turned out with no more trouble than those for domestic use.

Still it is not absolutely necessary to make the use of the metric system mandatory. Germany, France and England have always managed to get a good slice of our trade, even though the first two are metric countries and Great Britain has a system which does not conform altogether to ours. Yet they have not felt called upon to adopt our system for their domestic use.

On the other hand, we, having the opportunity in many shops of seeing both systems work side by side, are in a position to determine which is the better, and if the metric system eventually supersedes our present system it will have won on its merits.

The fear of confusion is practically groundless. Many of the older ones among us remember when all talk was in shillings and pence but all transactions were made in dollars and cents with no difficulty whatever.

While there are, according to the Bureau of Standards, 34 countries where the metric system is obligatory and only 11 where it is optional, the population of the latter is about 150 per cent greater than that of the former.

Our legislators are too prone to force instead of foster industry, and there is no immediate call for the bills which are now before the Committee on Coinage, Weights and Measures.

H. D. MURPHY.

The Literacy Test

To the Editor: The opponents of the bill which is at present before Congress embodying a literacy test for immigration seem to think that there are no objections to an unrestricted immigration. Before objecting too strenuously to the proposed legislation, however, it might be well to consider certain points and after weighing the matter carefully be reasonably sure that the advantages of non-restriction so overbalance the disadvantages as to make the latter practically negligible.

While it may be true that organized labor is one of the forces behind this bill, it will shed no crocodile tears if the law should fail of enactment because unrestricted immigration adds just that many more to the labor vote with which the leaders frighten the politicians as being able to "deliver" it at each election.

This nation has prospered with immigration, but there is a vast difference between that of the past and that of to-day. The immigration of the past not only could have stood in most cases any literacy test likely to be required, but that portion of it which could not come here untainted by the pernicious doctrines which to-day threaten the existence of the European countries. No literacy test has kept or will keep out of this country those agitators gifted with oratory or pen who have done the mischief in their own countries and have moved on to this. It will, however, keep out the men whose emotions and passions, because of their inability to think for themselves, are so responsive to such teachings. It is well to consider whether unrestricted immigration comes cheap at the price of a Youngstown riot.

Just as strongly may we argue that the absence of prosperity in recent years is due to unrestricted immigration. These men obtain the franchise before they have learned either to respect our institutions or regard our traditions. The agitator is right on the job to preach contempt for both as soon as the immigrant lands and the ballot is offered to him simply as a means to an end—not as an evidence of real citizenship. To these votes and to the delivered labor vote the politician truckles and for it makes business, big and little, his target.

Of course, with a restricted immigration we must of necessity revert to a high protective tariff. In fact, this must be our salvation anyway, as a careful study of our political history will show that our previous prosperity has been due to our tariff policy and not to our immigration policy.

A. D.

Importance of Sending Descriptive Matter with Machinery

To the Editor: Manufacturers in this country do not generally appreciate the importance of sending with each machine they produce, full descriptions for assembling and operating. Many do not realize that where machines are shipped to out-of-the-way localities, especially foreign countries, the class of labor available for erecting and originally operating machinery is not of the highest intelligence, but is in fact of very limited intelligence. Consequently, when a machine arrives, usually in parts, the utmost difficulty is found in bringing the parts together, and it not infrequently happens that serious injury results from an attempt to force parts into positions which they are not intended to oc-

cupy, or, if a machine be assembled, in improperly starting it.

The European practice is better. European manufacturers as a rule furnish with each machine full detailed drawings, and descriptions are usually printed upon paper and mounted upon cloth, with the surfaces varnished or otherwise treated so that they will not easily be soiled. The drawings and descriptions are arranged to be folded, so that they may easily be filed. In every case the manufacturers number such drawings and descriptions and keep a record of them. This practice enables them instantly to identify machines, where the foreign correspondent merely refers to the number of the drawing and description, or to replace drawings and descriptions which are lost.

In discussing American machinery with manufacturers and agents throughout South America and Europe, they have frequently referred to such drawings and descriptions and pointed out how useful and valuable they are, not only to them, but to the manufacturer. The statement is often made that they would very much dislike to give orders to any manufacturer who did not provide them with such information and means for record.

The American manufacturer as a rule does not understand, and seems to be obstinate about trying to understand, that very little things have a material effect in obtaining reorders, not only in this country, but especially in Europe. Another thing: European manufacturers, in sending out blue prints to foreign countries, as a rule back the blue prints. They do this for the reason that the blue prints are very apt to be destroyed in the mail; further, in many countries the climatic conditions are such, both as regards humidity and temperature, that blue prints are very rapidly destroyed. They argue that if it is worth while to send descriptive drawings or blue prints, it is equally worth while to see that they remain in a condition to be consulted for a reasonable length of time. It would cost the American manufacturers very little money to adopt the plan of the European manufacturers as above outlined.

GEORGE H. BENJAMIN.

New York, April 29, 1916.

Courses in Foreign Trade

Dr. Edward E. Pratt, chief of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, is the director of an educational course in foreign trade, which has just been announced. Associated with Dr. Pratt in preparing the course are men prominent in export activities, including O. P. Austin, of the National City Bank of New York; E. N. Vose, editor of *Dun's International Review*; E. A. De Lima, president of the Battery Park National Bank, New York; Prof. Emory R. Johnson and Dr. G. G. Huebner, of the University of Pennsylvania. The course covers a treatment of the various factors entering into export marketing, such as world trade economics, export policies, export houses, direct exporting, the export salesman, shipping, financing, export technique, foreign and home law and importing. It is supplied to corporations and firms for study by their employees, and to others interested in foreign trade, through the Business Training Corporation, 185 Madison Avenue, New York, of which W. H. Lough is president.

A new tax question is before the Court of Appeals of Kentucky in a suit against Muir & Halstead, a Nelson County firm, owning a block of stock in the United States Steel Corporation, which a State revenue agent undertook to have assessed for taxation. The defendants won in the lower court on their contention that the Steel Corporation owns a controlling interest in subsidiary corporations in Kentucky and its stock is consequently exempt because the property of the subsidiaries is taxed in Kentucky.

The U. S. Electro Lead Plating Company, incorporated with a capital stock of \$10,000 by John Howarth and others, has established a plant at 1265 West Second Street, Cleveland, Ohio, for commercial lead plating under a recently developed process.

March Exports Made New High Record

Metal-Working Machinery Scored an Especially Notable Increase—Tonnage Commodities Surpass Record of Last August

WASHINGTON, D. C., May 9, 1916.—New high marks were recorded in exports of iron and steel manufactures, tonnage commodities and machinery in March, 1916, according to figures compiled by the Bureau of Foreign and Domestic Commerce. Metal-working machinery, especially, scored a notable record-breaking increase. Total shipments of iron and steel products, on a basis of value, gained nearly 200 per cent over those of March, 1915, and nearly 8 per cent over the record total of February of the present year. Tonnage commodities rose 152 per cent over the total of March, 1915, and surpassed the banner month of the war boom, August, 1915, by nearly 10 per cent. Exports of machinery made a gain over March, 1915, of 62 per cent and of 2½ per cent over the great record of November, 1915. Shipments of metal-working machinery exceeded the high record of November, 1915, by more than 40 per cent.

The figures for the nine months of the fiscal year 1916, which cover the period of the marked revival which began early last summer, make a striking contrast with those for the corresponding months of 1915, which include the depression immediately following the outbreak of the war. Exports of iron and steel manufactures gained nearly 200 per cent over 1915 and nearly 100 per cent over the record figures of 1913. Tonnage commodities also show a 200 per cent increase over the nine months of 1915, while shipments of machinery gained 100 per cent.

EXPORTS OF IRON AND STEEL

The value of all shipments of iron and steel products in March, 1916, was \$58,300,297, as compared with \$20,551,137 for the same month of 1915, while for the nine months of 1916 the total was \$413,421,252, as compared with \$142,291,994 for the same period of 1915 and \$225,535,437 in 1913, the record total for the first nine months of the fiscal year.

1915 and 159,998 tons in March, 1914. The total for the nine months ended March was 3,404,009 tons, as compared with 1,159,415 tons for the same period of 1915 and 1,638,286 tons for the nine months of 1914.

The following table shows the exports of tonnage iron and steel in March and for the nine months ended March, 1916, as compared with 1915:

	Exports of Iron and Steel			
	March 1915 Gross Tons	1916 Gross Tons	Nine Months 1915 Gross Tons	Nine Months 1916 Gross Tons
Pig iron	7,263	19,110	73,716	190,818
Scrap	1,068	13,112	14,695	97,978
Bar iron	557	10,272	4,624	51,899
Wire rods	10,731	11,559	54,100	124,137
Steel bars	17,252	57,111	118,886	428,238
Billets, ingots and blooms, n.e.s.	26,410	107,696	81,705	614,157
Bolts and nuts	1,050	2,432	9,425	23,929
Hoops and bands	2,469	4,161	9,676	31,298
Horseshoes	1,387	305	7,414	10,182
Cut nails	75	317	1,431	3,621
Railroad spikes	673	2,611	4,369	19,268
Wire nails	3,756	11,407	33,788	88,423
All other nails, including tacks	555	553	2,976	7,188
Cast-iron pipes and fit- tings	1,720	3,165	46,126	37,193
Wrought pipes and fittings	7,905	8,992	75,444	93,168
Radiators and cast-iron house heating boilers	122	147	2,159	1,849
Steel rails	11,420	49,034	94,403	420,851
Galvanized iron sheets and plates	4,924	6,059	30,751	56,463
All other iron sheets and plates	1,365	3,037	5,980	30,049
Steel plates	9,069	18,613	73,833	208,873
Steel sheets	7,997	8,121	67,121	69,684
Structural iron and steel	16,943	21,591	118,976	201,895
Tin and terne plates	10,500	20,364	56,394	152,751
Barb wire	15,132	37,242	88,563	259,858
All other wire	13,926	21,139	82,900	178,937
Total	174,269	438,150	1,159,415	3,404,009

MACHINERY EXPORTS

Exports of machinery in March, 1916, were valued at \$16,243,981, as compared with \$10,053,895 for the

Exports of Machinery

	Exports of Machinery			
	March 1915 \$	1916 \$	March 1915 \$	Nine Months 1915 \$
Adding machines	\$35,519	\$120,809	\$346,654	\$657,671
Air-compressing machinery	47,473	53,346	275,320	402,070
Brewers' machinery	3,205	1,067	93,199	20,851
Cash registers	100,040	154,601	1,045,841	957,463
Parts of	5,882	21,744	82,424	92,418
Cotton gins	4,682	2,579	32,754	58,037
Cream separators	19,074	29,344	126,931	358,199
Elevators and elevator machinery	63,865	237,625	615,222	1,095,767
Electric locomotives	31,562	15,784	249,096	395,376
Gas engines, stationary	28,285	21,253	329,561	244,520
Gasoline engines	755,236	1,394,653	3,059,149	6,698,601
Steam engines	224,194	212,660	1,870,377	11,641,548
All other engines	148,846	552,050	522,759	1,748,695
Parts of	241,925	617,761	1,831,171	4,872,940
Laundry machinery, power	26,404	49,285	188,950	215,687
All other	12,906	11,115	167,319	206,301
Lawn mowers	24,766	16,671	203,736	137,464
Metal-working machinery (including metal-working tools)	3,863,913	6,501,022	17,363,886	36,360,844
Meters, gas and water	18,463	27,721	230,154	192,768
Milling machinery (flour and grist)	153,151	167,960	703,464	1,948,448
Mining machinery, oil well	190,384	57,617	1,657,905	843,328
All other	376,669	492,199	3,100,149	4,767,332
Paper-mill machinery	123,387	48,453	527,891	703,188
Printing presses	105,306	88,360	1,046,972	1,030,215
Pumps and pumping machinery	236,577	279,509	1,804,922	3,198,976
Refrigerating and ice-making machinery	29,305	25,655	388,776	510,497
Sewing machines	505,946	490,568	4,571,004	4,085,194
Shoe machinery	94,430	87,487	835,808	1,014,248
Sugar-mill machinery	103,171	93,585	1,584,793	5,271,324
Textile machinery	137,021	316,803	1,129,144	1,722,606
Typesetting machines	44,512	97,186	584,598	511,347
Typewriting machines	514,573	842,010	3,416,738	6,295,551
Windmills	51,144	93,643	496,600	724,170
Wood-working machinery, saw-mill	11,166	59,112	174,315	262,826
All other	26,143	120,501	443,100	882,992
All other machinery, and parts of	1,694,770	2,842,243	11,931,643	22,443,966
Total	\$10,053,895	\$16,243,981	\$62,982,935	\$122,633,428

The exports of iron and steel for which quantities are given aggregated 438,150 gross tons in March, 1916, as compared with 174,269 tons for the same month of

same month of 1915 and \$9,588,274 in March, 1914. Shipments of metal-working machinery, which had declined since last November, scored a big increase and

nearly doubled the figures for March, 1915. Exports of machinery of all kinds for the nine months ended March, 1916, were valued at \$122,633,428, as compared with \$62,982,935 for the corresponding period of 1915.

Details of the exports of machinery for March, 1915 and 1916, and for the two nine months' periods are as given in the accompanying table.

IMPORTS OF IRON AND STEEL

Imports of tonnage iron and steel amounted in March, 1916, to 15,158 tons, as compared with 8054 tons for the same month of 1915, a large proportionate increase, but a heavy decrease as compared with several months during the current fiscal year. The total for the nine months ended March, 1916, was 230,394 tons, as against 201,130 tons for the same period of 1915.

The following table shows the imports of tonnage commodities for March and for the nine months ended March, 1916, as compared with 1915:

	Imports of Iron and Steel		March		Nine Months	
	1915.	1916.	Gross	Gross	Gross	Gross
			Tons	Tons	Tons	Tons
Ferrosilicon	592	716	24,922	3,762		
All other pig iron	2,385	7,789	79,891	81,782		
Scrap	1,847	3,635	25,303	79,621		
Bar iron	634	162	18,202	5,171		
Structural iron and steel	187	166	5,363	1,098		
Hoop or band iron	470			
Steel billets without alloy	69	769	954	6,490		
All other steel billets	931	910	20,954	7,208		
Steel rails	430	412	15,691	39,599		
Sheets and plates	161	189	2,317	1,309		
Tin and terne plates	53	44	4,608	494		
Wire rods	765	366	3,470	3,390		
Total	8,054	15,158	201,130	230,394		

Preliminary figures from the leading ports covering April indicate that the export movement was well sustained throughout that month, but no accurate comparison can yet be made with the big business record in March.

W. L. C.

Triple Supply Convention at Pittsburgh

The triple convention of the Southern Supply and Machinery Dealers' Association, the National Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association opened in the William Penn Hotel, Pittsburgh, on Wednesday morning at 10 a. m. Many of those attending the annual convention of the National Pipe and Supplies Association, which met in Pittsburgh on Monday and Tuesday of this week, are also members of one or more of the triple associations, and are staying over to attend their convention. The Pittsburgh committee rooms, in the William Penn Hotel, are equipped with stenographers and typewriters, local and long-distance telephones, booklets giving valuable information about the industries of Pittsburgh, and other conveniences. It is expected that the triple convention will be attended by about 800 out-of-town members and about 200 from Pittsburgh, so that the total attendance is expected to reach 1000 or more. The convention will last three days, and every minute will be taken up either with active work or entertainment.

At the opening of the convention on Wednesday morning the attendance was very heavy, and an address of welcome was delivered by Charles J. Graham, Graham Nut Company, Pittsburgh, Pa. Mr. Graham was followed by Robert Garland, of the Garland interests, and a member of the City Council of Pittsburgh, who spoke in behalf of the Pittsburgh civic interests. Frank J. Lanahan, Fort Pitt Malleable Iron Company, then welcomed the convention on behalf of the Pittsburgh Chamber of Commerce. Responses to these addresses of welcome were made by J. G. Belding, president Southern Supply and Machinery Dealers' Association; H. W. Strong, president National Supply and Machinery Dealers' Association, and Farnham Yardley, president American Supply and Machinery Manufacturers' Association. An address was next delivered by R. G. Rhett, Charleston, S. C., who is president of the Chamber of Commerce of the United States. All indications point to this convention as the most successful in every way ever held by the three associations.

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The Proposed Government Nitrate Plant

How It Would Work Against the Development of the By-Product Coke Industry —Oxidation of Ammonia Favored

In connection with the consideration now given at Washington to the building of a Government-owned nitrate plant, a pamphlet is being circulated, prepared by C. J. Ramsburg and Horace Porter of the H. Koppers Company, Pittsburgh, dealing with the "By-Products of the Coking of Coal in the United States and Their Contribution to Preparedness." In their cogent putting of the case the writers say at the outset:

"The passage of the bill establishing a Government-owned nitrate plant will cause a serious set-back to the by-product coking industry.

"The development of the by-product coking industry during the next few years is probably more essential to national preparedness in the United States than that of any other single industry. The establishing also of industrial independence for this nation depends very largely on the growth of this industry."

REASONS AGAINST GOVERNMENT PLANT

Putting the argument in a nutshell the pamphlet gives first these considerations:

"1. We have now in this country an immense source of nitrogen or nitric acid in the ammonia being produced from the coking of coal.

"2. The most economical and practicable process for making nitric acid in this country by the aid of water power requires first making ammonia and then converting the ammonia into nitric acid.

"3. Of the ammonia being produced in this country 90 per cent is from by-product coke ovens.

"4. A subsidized Government plant for producing ammonia to be sold as fertilizer in times of peace will start ruinous competition with the by-product coking industry.

"5. The by-product coking industry is now getting an excellent start in the United States, largely by reason of the fact that it effects a saving to the steel manufacturer of about \$1.50 per ton in the cost of producing pig iron, provided by-products are sold advantageously.

"6. Ammonia is, in times of peace, the principal source of revenue from the by-products of coking. Its sale value is about 90c. per ton of coke produced.

"7. The manufacture of tri-nitro-toluene, the most efficient and most largely used of the modern explosives, depends upon the by-product coking industry, since the sole supply of toluene is derived therefrom. Benzine also is essential to explosives manufacture.

"8. The development of the dye-stuffs industry depends upon the supply of benzol, toluol and coal tar, all of which are practically exclusively obtained from the by-product coking industry. The dye-stuffs industry furthermore will furnish the plant and machinery for explosives manufacture in time of war.

"9. The manufacture of domestic gas now depends almost entirely on the use of oil, and 7 per cent of the country's petroleum production goes for that purpose. By-product coking supplies a better and cheaper domestic gas and must be relied on to conserve our petroleum for naval and other uses.

"Summary: Since the proposed nitrate plant must make ammonia first, and since from the coking of coal we now have an entirely adequate source of ammonia, the passage of the bill for this plant will be an absolute waste of Government funds; instead of promoting preparedness it will cripple the industry which most advances preparedness, namely the by-product coking of coal."

WHAT THE PROPOSAL INVOLVES

Taking up the argument, the effect of the proposal now before Congress is thus stated:

"An amendment to the Chamberlain army increase

bill proposes to invest \$15,000,000 of Government funds in a plant to produce ammonia from the nitrogen of the air and convert the ammonia into nitric acid. The ammonia, in ordinary times, is to be sold for use as fertilizer, and in the event of war is to be converted into nitric acid for the manufacture of explosives.

"A large amount of nitrogenous fertilizer will thus, in time of peace, be thrown upon the market, and by the consequent natural drop in prices other large producers of this material will suffer serious injury."

BY-PRODUCT AMMONIA SUFFICIENT

It is then shown that the by-product coking industry would afford an adequate supply of ammonia with which to make nitric acid in an emergency. The amount of ammonia and other coke by-products available in this country are given in the following table. The first column represents the capacity of plants in operation April 1, 1916. The second gives the total capacity of plants already built and those under construction or decided upon:

Producing Capacity of By-Product Coke Plants in the United States

Coke (net tons)	Annual Capacity of Present Plants 18,000,000	Annual Capacity of Plants Built, Building and Projected 33,000,000
Gas (surplus, not used in coking, having a heating value of 550 B.t.u. per cu. ft.), at 8500 cu. ft. per ton of coke	153,000,000,000	280,500,000,000
—(cu. ft.)	198,000,000	363,000,000
Coal tar, at 11 gal. per ton of coke (gal.)	468,000,000	858,000,000
Ammonium sulphate, at 26 lb. per ton of coke (lb.)	54,000,000	99,000,000

A table of prices is given showing that ammonium sulphate is one of the cheapest forms of nitrogen available for fertilizer. While the Government ammonia producing plant and the expensive auxiliary, a water-power plant, are considered unwarranted, the process for making nitric acid from ammonia, it is argued, may well be investigated and developed in this country under Government supervision. It is shown that by the cyanamid process, which is the one expected to be used, at a Government plant to produce ammonia for nitric acid, the cost of producing ammonia would be over 8c. per pound. Even with electric power at the Norway price, this process could not produce nitric acid as cheaply as the ammonia oxidation process. The cost of the latter is claimed to be moderate, not over 3c. per pound of 53 per cent acid, including the cost of ammonia and the capital charges of the investment. A unit making 5 tons of 53 per cent acid per day is said to cost about \$55,000.

At the conservative figure of 26 lb. of ammonium sulphate yielded in the by-product coking process per ton of coke produced, the present capacity of the by-product coking industry in the United States is 234,000 tons of ammonium sulphate per year, and the annual capacity of this industry within about eighteen months after completion of the plants now under construction and provided for will be about 430,000 tons of ammonium sulphate and 33,000,000 tons of coke. By the process of oxidation of ammonia, the amount of ammonia equivalent to one ton of ammonium sulphate can be turned into about 1.1 tons of nitric acid (53 per cent). Thus, within eighteen months this country will be able to produce 470,000 tons of 53 per cent nitric acid in a year.

It is pointed out that the United States is not as dependent upon the use of fertilizers as Germany, for example, and that in case of war all ammonium sulphate made here could be diverted to war needs except about 100,000 tons for cotton raising in the South.

CONCLUSIONS

In summing up, the writers say:

"The steel industry, most largely, and other industries to a lesser extent, are rapidly increasing the use and production of by-product coke in this country. Its continued advance, however, will depend on advantageous disposal of ammonia and other by-products.

"If the Government should establish a large plant to make ammonia and nitric acid by fixation of atmospheric nitrogen, and thus enter into competition with coke-oven ammonia, the entire by-product coking industry would receive a setback, and the production of other by-products such as benzol, toluol, coal tar, coal gas, and dyestuffs would be retarded.

"With the by-product coke ovens now built and those under construction and contracted for, sufficient ammonia will be produced to take care of absolute needs for fertilizer and leave 280,000 tons (as sulphate) per year for munitions manufacture. Germany is now using no more than this for this purpose.

"By substituting the by-product coking process for the old-fashioned beehive method, we can increase our total ammonia production to over 700,000 tons (as sulphate), without over-stocking the coke market.

"The question is then pertinent: Why subsidize by Government funds a new and expensive source of ammonia, and discourage development of a by-product recovery industry necessary to the nation's industrial advance?"

Iron, Steel and Heavy Hardware Convention

Secretary A. H. Chamberlain has sent out the program for the convention of the American Iron, Steel and Heavy Hardware Association, which will be held at Pittsburgh, May 23 to May 26. The executive committee holds its meeting on Tuesday afternoon, May 23, and the convention sessions begin Wednesday morning under the direction of the president, J. A. Gregg, of Nicols, Dean & Gregg, St. Paul. There will be an address of welcome, to which E. J. McCarthy, Buffalo, and Frederick H. Payne, Greenfield, Mass., will respond. The president's annual address is a feature of the first session, and there will be an address on the Stephens bill relating to resale prices by Congressman Dan V. Stephens, of Nebraska.

At an executive session, Wednesday afternoon, reports will be presented by the secretary-treasurer, the executive committee, the horseshoe committee, the bolt and nut committee and the wheel and woodstock committee.

Thursday will be a busy day. An executive session will be held at 9 a. m., at which reports will be presented by the pad, nail, calk and insurance committees. At 11 o'clock, in an open forum on "The Future," papers will be read by C. M. Roehm, Detroit; F. H. Butts, Boston, and James A. Coe, Newark, N. J., followed by discussion. On Thursday afternoon reports will be presented by the committees on iron and steel, automobile accessories, public policy, cost of doing business, springs and axles, and transportation. E. Jungquist, Los Angeles, Cal., will read a paper on "A Working Credit System." At the open session Friday morning there will be the election of officers and their introduction, the selection of the next convention city and the transaction of unfinished business.

On Wednesday evening a reception and ball will be given at the William Penn Hotel, and at the same place a banquet on Thursday evening. Friday afternoon is set apart for a steel plant trip and the evening's event will be a smoker and cabaret.

D. H. Ross, Canadian trade commissioner at Melbourne, Australia, informs the Canadian Government that the New South Wales Railway Commissioners have placed a contract for the supply of 300 locomotives, to cost \$5,000,000, with the Clyde Engineering Company, Sydney, Australia. The locomotives are to be supplied during the next five years. Mr. Ross states that the order may be of interest to Canadian manufacturers, as a considerable proportion of the materials and fittings used in the construction of the engines will, as heretofore, likely be imported from other countries.

Convention of National Pipe and Supplies Association

The annual meeting of the National Pipe and Supplies Association opened in the William Penn Hotel, Pittsburgh, on Monday morning, May 8, with about 200 present. The first session was an open one. An address of welcome was made by A. B. Pierce, president, who referred to the great activity in the pipe and supply trades. Brief expressions of opinion were then made by manufacturers and jobbers as to present conditions and the outlook. The outlook is regarded as most promising, the mills being sold up on tubular goods for some months ahead, and jobbers are enjoying a very heavy demand from consumers.

An address by Harry A. Wheeler, vice-president Union Trust Company of Chicago, and ex-president and now honorary vice-president of the Chamber of Commerce of the United States of America, on "By-Products of the European War," was most interesting. He said the outlook is hopeful because greater Federal co-operation has been obtained to encourage business and there has been a unification of the people of the country toward the patriotic purposes laid down by the founders of the Republic. He advocated a tariff commission and declared that all business men hoped that the day of old-time tariff "tinkering" was forever past. He said the country had achieved financial independence and relied more than ever on its own industries. "If we are wise enough to throw the proper protection around our industries, our success and self-sufficiency will go on and on." In closing he made a plea for preparedness and an American mercantile marine. An address on "Co-operation" was made by N. O. Nelson, president N. O. Nelson Mfg. Company, St. Louis, Mo. At the close of that address the convention went into executive session, to which only members and other jobbers who were invited were admitted.

The officials of the association are: A. B. Pierce, N. O. Nelson Mfg. Company, St. Louis, Mo., president; James S. Smith, Henry N. Bolthoff Mfg. & Supply Company, Denver, Col., vice-president; Frank N. Sheldon, Bramen-Dow Company, Boston, Mass., second vice-president; George D. McIlvaine, 909 Oliver Building, Pittsburgh, secretary. The treasurer, G. W. K. Taylor, McMann-Taylor Company, New York City, died several months ago, and his duties have since been filled by Mr. McIlvaine.

On Wednesday afternoon those in attendance were the guests of the National Tube Company on a visit of inspection to its National works at McKeesport, Pa. They were taken on a steamboat up the Monongahela River to McKeesport, where guides were furnished to conduct the visitors through the various plants, and dinner was served on the boat on the return trip in the evening.

Boiler Manufacturers' Convention

The twenty-eighth annual convention of the American Boiler Manufacturers' Association will be held at the Hollenden Hotel, Cleveland, Ohio, June 19 and 20. An interesting program is being prepared, including a discussion on uniform cost system and reports of progress toward the adoption of the A. S. M. E. boiler code by various States. The executive committee expects to arrange for a visit to one or two Cleveland manufacturing plants of interest to boiler builders during the convention. W. C. Connelly of the D. Connelly Boiler Works Company, Cleveland, Ohio, is president of the association.

On May 1 the Cleveland offices of the Niles Tool Works Company were removed from the Rockefeller Building to the Perry Payne Building, at 730 Superior Street. The new quarters provide a large show room and store stocked with Pratt & Whitney machinery, small tools and gages. This company represents the Niles-Bement-Pond Company for its entire line of machine tools, steam hammers, electric traveling cranes, etc.

Iron and Steel Markets

NEW SALES OF SHELL STEEL

Europe Still Paying Buyers' Prices

Railroad Buying Less—A Subsidence in Pig Iron —High Mark in Exports

The placing of new contracts for upward of 150,000 tons of shell steel in the form of blooms and rounds and negotiations for as much more war steel, including 50,000 tons for Russia and Italy, are the chief developments of the week. Otherwise the steel trade has slowed down, as it has long needed to do.

Buyers for the Allies did not get any 3c. steel in these late transactions. For blooms \$80 to \$85 was paid and for rounds 3.5c. to 3.75c. On some pending business \$75 has been offered for shell forgings, but sellers hold for more. At Pittsburgh 30,000 tons of rounds was sold to Italy and inquiries there represent 90,000 tons, besides 35,000 tons at Cleveland.

Steel companies which some weeks ago were turning away domestic business for this year seem to have reserved space for renewals of contracts with belligerent countries. Foreign and home consumers in some cases have virtually competed for the available steel, the highest price deciding which should get it.

The labor situation in the Pittsburgh district is clearing up. The loss of pig-iron and steel production was small, but foundry and machine shop strikes are still noticeably affecting consumption.

The market promises to have some rest from price advances. Pipe may go higher, and one or two wire manufacturers are getting \$1 a ton above the general level. But there is a slight easing up in semi-finished steel. At Pittsburgh ingots from steel foundries have sold at \$40, and billets and sheet bars have been offered at that figure for third quarter.

The Steel Corporation's rail contracts in April prevented a considerable falling off from the previous rate of increase in unfilled orders. At the unheard-of total of 9,829,551 tons on April 30, last month's increase was 498,550 tons, against 762,035 tons in March and 646,199 tons in February.

Ironton, Ohio, basing prices have disappeared for the time being in wire products and various Southern buyers now pay higher prices based on Pittsburgh. The wire trade is a good example of the way the export outlet bolsters prices. Though barb wire consumption at home is reduced by high prices, foreign demand is a stop-gap, a new sale of 30,000 tons having been made to the Allies. Tin plate prices are being pulled up by export sales at \$5.50 per box.

While some Central Western sheet mills have advanced to 3c. for No. 28 black, 2.90c. is still done.

In the Eastern sheet trade the amount of business booked for third quarter is relatively small.

The \$5 advance on rails applied to 15,000 or 20,000 tons booked in the past week. Generally railroad buying has fallen off. An order for 1000 wood box cars for the Chicago & Northwestern is one example of the effect of high priced steel.

Pig iron buying has shown decided subsidence. There is also the fact that some producers have reversed the condition existing only recently and are now selling for farther forward delivery at less than for this year. Various Buffalo sales for 1917 represent such concessions.

Southern iron has sold in the Chicago district and in the Central West at \$15 for the last half and for the early months of 1917 at \$15.50 at furnace.

A western Pennsylvania steel company is buying Bessemer iron from week to week. A 10,000-ton sale was made at Youngstown at \$21 at furnace for export to Italy. A southern Ohio steel company has bought 20,000 tons of basic.

Such iron and steel exports as are reported in tons made a new record at 438,000 tons in March. The average for the preceding six months was about 375,000 tons and the previous high month was August with 401,000 tons.

At 3,311,000 tons the amount of iron ore on Lake Erie docks was less on May 1 than in any year since 1907. A year ago the total was 5,900,000 tons. April shipments from Lake Superior ranges were 1,658,000 tons. Even with that good start a late closing will be needed, as it now seems, to get down enough ore. Prices are expected to be higher in 1917.

Pittsburgh

PITTSBURGH, PA., May 9, 1916.

The labor troubles in this district are slowly clearing, but it may be some time before all the plants affected are on full time again. The shutdown of a number of the larger plants, such as those of the Westinghouse Electric & Mfg. Company, the Pressed Steel Car Company and others, meant a serious loss, not only in wages to the men but also in consumption of materials by these concerns, and this has been felt. Local steel mills report that specifications in the past week showed a falling off. There were no price advances during the week, with the exception that some concerns put up prices on light black sheets \$1 to \$2 per ton and the same on galvanized. The output of material this month will not be as heavy as in April. For a few days 10 of the 11 blast furnaces of the Carnegie Steel Company at Bessemer were banked, but they are all in operation again. With labor troubles out of the way it is believed the pressure on the mills for material will be as heavy as ever. The output of plates by the Carnegie Steel Company in April at its Homestead works, Sharon works and the Upper and Lower Union mills in this city was only a little short of 100,000 tons, and yet, in spite of this large output shipments are as far back as ever. Many of the

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

	May 10,	May 3,	April 12,	May 12,
Pig Iron, Per Gross Ton:	1916.	1916.	1916.	1915.
No. 2 X, Philadelphia...	\$20.50	\$20.50	\$20.50	\$14.25
No. 2, Valley furnace...	18.50	18.50	18.50	12.75
No. 2, Southern, Cin'ti...	17.90	17.90	17.90	12.40
No. 2, Birmingham, Ala...	15.00	15.00	15.00	9.50
No. 2, furnace, Chicago*	19.00	19.00	19.00	13.00
Basic, de'd, eastern Pa...	20.50	20.50	20.50	13.25
Basic, Valley furnace...	18.00	18.00	18.25	12.50
Bessemer, Pittsburgh...	21.95	21.95	21.95	14.55
Malleable Bess., Ch'go...	19.50	19.50	19.50	13.00
Gray forge, Pittsburgh...	18.70	18.70	18.70	13.45
L. S. charcoal, Chicago...	19.75	19.75	19.75	15.75

Billets, etc., Per Gross Ton:

Bess. billets, Pittsburgh...	45.00	45.00	45.00	20.00
O.-h. billets, Pittsburgh...	45.00	45.00	45.00	20.00
O.-h. sheet bars, P'gh...	45.00	45.00	45.00	21.00
Forging billets, base, P'gh	69.00	69.00	67.50	26.00
O.-h. billets, Phila...	50.00	50.00	50.00	22.02
Wire rods, Pittsburgh...	60.00	60.00	60.00	25.00

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47 1/2	1.47 1/2	1.25	1.25
O.-h. rails, heavy, at mill	1.56 1/2	1.56 1/2	1.34	1.34
Iron bars, Philadelphia...	2.65	2.65	2.65	1.17 1/2
Iron bars, Pittsburgh...	2.60	2.60	2.50	1.20
Iron bars, Chicago...	2.35	2.35	2.35	1.15
Steel bars, Pittsburgh...	3.00	3.00	2.75	1.20
Steel bars, New York...	3.16	3.16	2.91	1.36
Tank plates, Pittsburgh...	3.75	3.75	3.75	1.15
Tank plates, New York...	3.91	3.91	3.91	1.319
Beams, etc., Pittsburgh...	2.60	2.60	2.50	1.20
Beams, etc., New York...	2.76	2.76	2.76	1.369
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.12 1/2
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.17 1/2
Steel hoops, Pittsburgh...	3.00	3.00	3.00	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Machine shops in this district are running short handed and the strike of the molders has curtailed the output of the foundries very materially. Prices of pig iron, semi-finished steel and finished products of all kinds are as strong as ever, with indications that on some lines, notably pipe, advances will be made in the near future. Higher prices on wire products are also likely, as several mills are quoting \$2.60 per keg base on wire nails, which is 10c. above the regular price. Tin plate is also likely to be higher, one local mill reporting several fair-sized domestic sales at \$5.50 per base box.

Pig Iron.—There is a fair degree of activity, and prices on all grades are firm. The Cambria Steel Company is taking fairly large quantities of Bessemer iron each week and will likely do so for some time. The Brier Hill Steel Company has sold to Italy 10,000 tons of Bessemer, which it had piled in its furnace stock yards, at \$21 at furnace. There are two inquiries in the market, each for 10,000 tons of Bessemer for export, presumably to Italy. Small lots of basic iron, ranging from 200 to 300 tons, have sold at \$18.25 at furnace. The new demand for foundry iron is quiet, and there are still some lots of foundry iron being offered for resale on account of the molders' strike. It is figured out that two or three of the leading steel companies will have to buy both Bessemer and basic before long, and should one or two large lots of either be closed up, prices would likely be higher as the supply of both Bessemer and basic is limited. Kittanning furnace at Kittanning, Pa., now being relined and repaired, will likely be ready for blast about July 1. W. P. Snyder & Co. have contracted to take 5000 tons per month of its output of basic in exchange for ore, and this will leave 2500 to 3000 tons per month to be sold in the open market. We quote Bessemer iron at \$21 to \$21.50; basic, \$18 to \$18.25; gray forge, \$17.75 to \$18; malleable Bessemer, \$18.50 to \$19, and No. 2 foundry, \$18.50 to \$19, all at Valley furnace, the freight rate from furnace for delivery in the Pittsburgh or Cleveland district being 95c. per ton.

Billets and Sheet Bars.—The supply of semi-finished open-hearth steel, mostly in the form of small ingots, seems to be increasing, and prices are a trifle easier. A number of the larger steel-casting concerns in the Pittsburgh district are selling steel ingots at \$40 and above per ton, which are being bloomed by outside con-

	May 10,	May 3,	April 12,	May 12,
Sheets, Nails and Wire,	1916.	1916.	1916.	1915.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	2.90	2.85	2.85	1.80
Galv. sheets, No. 28, P'gh.	5.00	5.00	5.00	3.40
Wire nails, Pittsburgh...	2.50	2.50	2.40	1.55
Cut nails, Pittsburgh...	2.60	2.60	2.60	1.55
Fence wire, base, P'gh...	2.45	2.45	2.25	1.35
Barb wire, galv., P'gh...	3.35	3.35	3.25	2.10

	May 10,	May 3,	April 12,	May 12,
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	18.00	18.00	18.00	11.75
Iron rails, Philadelphia...	20.00	20.00	20.00	15.00
Carwheels, Chicago....	13.00	13.00	14.00	9.75
Carwheels, Philadelphia...	17.00	17.00	17.50	11.50
Heavy steel scrap, P'gh.	17.25	17.25	18.00	11.75
Heavy steel scrap, Phila.	17.00	17.50	18.00	11.50
Heavy steel scrap, Ch'go.	16.00	16.00	16.50	9.25
No. 1 cast, Pittsburgh...	16.25	16.25	16.00	12.00
No. 1 cast, Philadelphia...	17.50	17.50	18.00	12.25
No. 1 cast, Ch'go (net ton)	12.50	12.75	13.00	9.00

Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt....	\$2.25	\$2.25	\$2.65	\$1.50
Furnace coke, future....	2.50	2.50	2.90	1.65
Foundry coke, prompt....	3.25	3.25	3.75	2.00
Foundry coke, future....	3.25	3.25	3.50	2.15

Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	29.00	29.00	28.00	21.00
Electrolytic copper, N. Y.	28.50	28.50	27.75	18.75
Spelter, St. Louis.....	16.25	17.25	18.75	14.00
Spelter, New York.....	17.00	17.50	19.00	14.25
Lead, St. Louis.....	7.37 1/2	7.37 1/2	7.87 1/2	4.10
Lead, New York.....	7.50	7.50	7.87 1/2	4.20
Tin, New York.....	59.75	52.50	53.00	40.00
Antimony, Asiatic, N. Y.	55.00	37.50	43.00	40.00
Tin plate, 100-lb. box, P'gh	\$5.00	\$5.00	\$4.50	\$3.15

cerns, and considerable quantities of open-hearth steel are being secured for the open market in this way. A local consumer has bought from a Cleveland, Ohio, interest 12,000 tons or more of heavy open-hearth slabs to be rolled into plates at about \$45 per ton, f.o.b. Pittsburgh. The Carbon Steel Company recently purchased 30,000 tons or more of special analysis billets to be rolled at its mills in this city into steel rounds for Italy. A local dealer is reported to have been offering in the last few days 10,000 tons of 1 1/2-in. open-hearth billets, and this is presumably Cleveland steel. We note sales of 2500 to 3000 tons of soft open-hearth billets for prompt delivery at about \$45, Pittsburgh. For delivery in three to four months, soft open-hearth billets and sheet bars have been offered as low as \$40, Pittsburgh. Mill prices for delivery in two to three months are about as follows: Bessemer billets, \$45; open-hearth billets, \$45; Bessemer sheet bars, \$45, and open-hearth sheet bars, \$45, maker's mill, Pittsburgh or Youngstown district. We quote forging billets at \$69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 extra.

Ferroalloys.—New inquiry for ferromanganese for spot shipment is quiet and prices are slightly easier. Carload lots of 80 per cent domestic are being offered for fairly prompt shipment at \$350 per ton or less. On contracts, with no guarantee as to delivery, English 80 per cent is still held at \$175 per ton, seaboard, but any contracts made at this price would mean that deliveries would not be likely before next year. There is still a great scarcity in the supply of spiegeleisen, 20 to 30 per cent being held at about \$75 per ton, delivered. Ferrosilicon is very firm, the supply being shorter than demand, but no changes have been made in prices. We quote 50 per cent ferrosilicon at \$85 for lots up to 100 tons, over 100 tons and up to 600 tons, \$84, and over 600 tons, \$83 all per gross ton, f.o.b. Pittsburgh. Prices of Bessemer ferrosilicon for delivery over remainder of the year are now quoted as follows, 9 per cent, \$32; 10 per cent, \$33; 11 per cent, \$34; 12 per cent, \$35; 13 per cent, \$36.50; 14 per cent, \$38.50; 15 per cent \$40.50, and 16 per cent, \$43. Seven per cent silvery for the same delivery is \$28.50; 8 per

cent, \$29; 9 per cent \$29.50; 10 per cent \$30; 11 per cent, \$31, and 12 per cent, \$32. All these prices are f.o.b. at furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky., each of these points having a freight rate of \$2 per gross ton to Pittsburgh.

Steel Rails.—The Bessemer & Lake Erie Railroad, the Union Railroad and the Clairton Terminal, all owned and operated by the Steel Corporation, have placed orders with the Carnegie Steel Company for 15,000 tons or more of standard section rails, most of these being 125-lb., and some 150-lb. The Carnegie Steel Company also took 20,000 tons from the Norfolk & Western, but its orders since May 1, when the advance of 5¢ per ton on Bessemer and open-hearth rails went into effect, have been very light and only for small lots. The demand for light rails is still very active, running 6000 tons per week or more, and on light rails the Carnegie Company is reported to be sold up for practically the remainder of this year. We quote light rails as follows: 25 to 45-lb. sections, 2.10c.; 16 and 20 lb., 2.15c.; 12 and 14 lb., 2.20c., and 8 and 10 lb., 2.25c., in carloads and up to 100 tons. An advance of 5¢ per 100 lb. is charged for less than carloads and down to 3 tons, while under 3 tons an additional 5¢ is charged. We quote standard section rails of Bessemer stock at 1.47½c., and open-hearth steel, 1.56½c., Pittsburgh.

Structural Material.—In spite of the very high prices on plain material, the inquiry for new work is active and some fairly large jobs have been placed. The American Bridge Company has taken 1900 tons for additions to buildings of the Firestone Tire & Rubber Company, and 1850 tons for similar work for the B. F. Goodrich Company, both at Akron, Ohio, also 400 tons for the Westmoreland Bank Building at Greensburg, Pa. The McClintic-Marshall Company has taken 1200 tons of bridge work for the Western Maryland, 850 tons for a high school at Portland, Me., and this company is low bidder on 1750 tons of structural steel for two bridges for the Boston Elevated and the city of Boston. The Riter-Conley Mfg. Company has taken 3000 tons for new steel building for the Struthers Furnace Company, Struthers, Ohio. The McClintic-Marshall Company is also reported to have taken 3000 tons for the Midvale Steel & Ordnance Company, Nicetown, Pa. We quote beams and channels up to 15 in. at 2.60c. to 2.75c. at mill, for delivery in third and fourth quarters of this year. Small lots for prompt delivery from warehouse stocks are held at about 3.25c. to 3.50c. and higher.

Plates.—New orders for steel cars are very scarce, the railroads refusing to pay the high prices quoted by the builders. The Pressed Steel Car Company is reported to have taken 1000 4-wheel gondolas for the Paris, Lyons & Mediterranean Railroad, and it is expected the order will be increased to 1500 cars. The Italian Government is still reported to be in the market for 4000 cars, but this is not confirmed. Sales of fairly large lots of plates by Eastern mills are reported on the basis of 4c., Pittsburgh. Consumers who must have plates promptly are compelled to pay 4c. and higher to obtain them. We quote ¼-in. and heavier plates for delivery at convenience of the mill, which would mean probably last quarter, at 2.75c. to 2.90c., while for shipment in two to three months 3.50c. to 4c. and higher are quoted.

Sheets.—Prices on light black and also on galvanized sheets are stronger, and two Youngstown mills have put their minimum price on No. 28 gage black sheets at 3c., f.o.b. Pittsburgh. Some mills are still naming 2.90c., but this seems to be absolute minimum of the market. On blue annealed, electrical and deep stamping sheets mills have very little to offer for delivery inside of five or six months, and two prominent mills are reported sold up for the remainder of the year. The supply of semi-finished steel is better, due partly to strikes at various plants in the Pittsburgh district, and deliveries of sheet bars are being made more promptly than for some time. We quote Nos. 9 and 10 blue annealed sheets at 3c. to 3.25c., the lower price being for delivery at convenience of the mill, which would probably be in last quarter of this year. We

quote No. 28 Bessemer black sheets at 2.90c. to 3c., and open-hearth, 3c. to 3.10c.; No. 28 galvanized Bessemer stock, 5c. to 5.10c., and open-hearth, 5.10c. to 5.15c., some mills quoting even higher prices. We quote Nos. 22 and 24 black plate, tin mill sizes, H. R. and A., 2.70c.; Nos. 25, 26 and 27, 2.75c.; No. 28, 2.85c.; No. 29, 2.95c., and No. 30, 3c. These prices are for carload and larger lots, f.o.b. mill, Pittsburgh.

Tin Plate.—It is predicted that by July 1, or before, prices of tin plate for delivery this year will be at least \$6 per base box. Most mills have actual specifications on their books covering their entire output up to October or later, and the export demand is heavy. A large sale of tin plate for export, involving close to 100,000 boxes, is said to have been made last week at \$5.50, and perhaps higher, per base box. Several makers are not quoting on export orders, their obligations being so heavy they cannot make deliveries. We now quote small lots from stock at \$5.25 to \$5.50 per base box, and for export nothing less than \$5.50, and in some cases a higher price is quoted. We quote 8-lb. coated ternes at \$7.75 for 200 lb. and \$8 to \$8.25 for 214 lb., all f.o.b. maker's mill, Pittsburgh.

Cold-Rolled Strip Steel.—We note a contract for 1200 tons of cold-rolled strip steel made last week for delivery in last half of the year at \$6 base per 100 lb., and also a sale of 20,000 lb. at \$7 for delivery at convenience of the mill, which would probably be in third quarter. The market is very strong at \$6 to \$6.25 on contracts for third quarter and last half of the year and \$6.25 to \$7 on orders for delivery at convenience of the mill, which would be in two or three months or longer. Most mills have their output sold up through third quarter and higher prices are likely. Extras, standard with all the mills, were given on page 810 in THE IRON AGE of March 30.

Skelp.—The market remains very firm, with mills sold up for five or six months. Prices are nominal, and for prompt delivery premiums would be readily paid. We quote grooved steel skelp at 2.35c. to 2.40c.; sheared steel skelp, 2.45c. to 2.50c.; grooved iron skelp, 2.70c. to 2.80c., and sheared iron skelp, 3c. to 3.10c., all delivered to consumers' mills in the Pittsburgh district.

Railroad Spikes.—While new inquiry is active, railroads are slow in closing contracts for spikes owing to the high prices quoted by the makers. The Chesapeake & Ohio is in the market for 15,000 to 20,000 kegs, and the Baltimore & Ohio has an inquiry out for an indefinite amount. Makers of spikes are holding prices firmly, being indifferent as to whether the railroads place contracts or not, as they can put the steel into other products for which there is a heavy demand at high prices. We quote:

Standard railroad spikes, 4½ x 9/16 in. and larger, \$2.65 to \$2.75; railroad spikes, ½ and 7/16 in., \$2.75 base; railroad spikes, ¾ in. and 5/16 in., \$3.05 base; boat spikes, \$2.80 base, all per 100 lb., f.o.b. Pittsburgh.

Rivets.—The demand is still very heavy. A local maker has sold three or four carloads for export to India and South Africa, and two carloads are reported to have been sold for shipment to Japan. Deliveries of steel by the mills are still very unsatisfactory and are restricting output of rivets to a considerable extent. Prices are very firm, and it is said will be higher. For immediate shipment and on contracts up to and including Sept. 30, 1916, structural rivets are quoted at \$3.75 and boiler rivets at \$3.85 per 100 lb., base; for fourth quarter of 1916, structural rivets are quoted at \$4 and boiler rivets at \$4.10 per 100 lb., base, f.o.b. Pittsburgh, terms 30 days net, or one-half of 1 per cent for cash in 10 days.

Nuts and Bolts.—It is said one or two makers are quoting prices about 10 per cent higher than regular discounts and are booking orders. Domestic demand is heavy and all the makers are back in deliveries 12 to 15 weeks or longer. Deliveries of steel by the mills are still unsatisfactory. The discounts, effective from April 20, which makers state are for prompt acceptance only, are as follows, delivered in lots of 300 lb. or more where the actual freight rate does not exceed 20c. per 100 lb., with terms 30 days net or 1 per cent for cash in 10 days.

Carriage bolts, small, rolled thread, 50, 10 and 5 per cent; small, cut thread, 50 and 5; large, 40 and 5.

Machine bolts, h.p. nuts, small, rolled thread, 50, 10 and 5 per cent; small, cut thread, 50 and 10; large, 40, 10 and 5.

Machine bolts, c.p.c. and t. nuts, small, 50 per cent; large, 45 and 10.

Blank bolts, 40, 10 and 5 per cent; bolt ends, with h.p. nuts, 40, 10 and 5 per cent; with c.p. nuts, 35 and 10. Rough stud bolts, 20. Lag screws (cone or gimlet point), 60.

Forged set screws and tap bolts, 15 per cent. Cut and round point set screws, case hardened, 60. Square and hexagon head cap screws, 55. Flat, button, round or fillister head cap screws, 35.

Nuts, h.p. sq., tapped or blank, \$2.90 off list; hex., \$2.90 off; c.p.c. and t. sq., tapped or blank, \$2.60 off; hex., \$3 off; semi-finished hex., 60 and 10 per cent; finished and case hardened, 60 and 10.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 10 per cent.

Wire Products.—The falling off in the demand for barb wire on account of the high prices has allowed several makers to book export orders, for which it is said they obtained higher prices than for domestic business. The leading interest is reported to have taken a contract recently for 30,000 tons or more of barb wire for shipment to the Allies. It is claimed that orders and specifications taken by the American Steel & Wire Company in April were about as large as in March, which was a record month. Wire nails and wire products are firmly held, and several mills are quoting \$2.60 on wire nails for fairly prompt delivery. Prices in effect from May 1 are as follows: Wire nails, \$2.50 per keg; galvanized, 1 in. and longer, taking an advance over this price of \$2, and shorter than 1 in., \$2.50. Plain annealed wire, \$2.45 per 100 lb.; galvanized wire, \$3.15; galvanized barb wire and fence staples, \$3.35; painted barb wire, \$2.65; polished fence staples, \$2.65; cement coated nails, \$2.50, base, all f.o.b. Pittsburgh, with freight added to point of delivery, terms 60 days, net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing are now 61½ per cent off list for carload lots; 60½ per cent for 1000-rod lots and 59½ per cent for small lots, f.o.b. Pittsburgh.

Shafting.—Some contracts for shafting for delivery in third and fourth quarters of this year have been made at 15 per cent off, and it is said that on some orders for fairly prompt shipment close to base price has been paid. All the shafting makers have their output sold up practically through third quarter and have taken contracts for delivery in fourth quarter. For delivery in two to three months 10 per cent off is quoted, with the supply very limited. We quote cold-rolled shafting at 15 per cent off in carload lots for delivery in third and fourth quarters, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars.—Several large inquiries for steel rounds for export are in this market, one said to be for 90,000 tons, while a local mill has taken 30,000 tons for shipment to Italy. The domestic demand for iron and steel bars is beyond all precedent, and mills are sold up for many months ahead. The leading interest has its output of steel bars sold up for all of this year and has contracts for delivery in first quarter of 1917. All the mills are far back in deliveries. In spite of their enormous output they are not catching up to any great extent. We quote steel bars at 2.60c. to 2.75c. for delivery at convenience of the mill, while for fairly prompt shipment 3c. to 3.25c. is quoted. We quote refined iron bars at 2.60c. to 2.75c.; railroad test bars, 2.70c. to 2.80c. at mill. These prices are for delivery at convenience of the mill, and for fairly prompt shipment premiums would be paid.

Hoops and Bands.—The market on hoops and bands for fairly prompt delivery is firm at 3c., and sales are reported to have been made at a higher price. Mill prices on hoops are 2.75c. for shipment at convenience of the mill, which would be in five or six months, and on steel bands, 2.65c. to 2.75c. for the same delivery.

Merchant Steel.—Mills report their output sold up through third quarter, and one maker has only a limited amount to offer for fourth quarter. Prices are very strong. On small lots for delivery at convenience of the mill, which would be in four or five months or longer, prices are about as follows: Iron-finished tire,

½ x 1½ in. and larger, 2.35c., base; under ½ x 1½ in., 2.50c.; planished tire, 2.55c.; channel tire, ¾ to ½ and 1 in., 2.85c. to 2.95c.; 1½ in. and larger, 3.25c.; toe calk, 2.95c. to 3.05c., base; flat sleigh shoe, 2.70c.; concave and convex, 2.75c.; cutter shoe, tapered or bent, 3.25c. to 3.35c.; spring steel, 2.95c. to 3.05c.; machinery steel, smooth finish, 2.75c.

Wrought Pipe.—An Oklahoma oil interest is in the market for 70 miles of 6-in. pipe, on which one mill quoted delivery in September and one or two others refused to quote, so that it is not likely the order will be placed. The demand for merchant pipe and oil country goods is enormously heavy, mills being sold up to August or later. Prices are very strong and, it is intimated, will be higher in the near future. One leading mill reports that its orders for tubular goods for the four months ended April 30 were nearly three times as large as in the same period last year. Discounts on iron and steel pipe are given on another page.

Boiler Tubes.—The demand is enormously heavy. Most makers of iron and steel tubes are not quoting for delivery before fourth quarter, but are doing the best they can to take care of their regular customers. Prices are strong and are likely to be higher within a short time. Discounts on steel and iron tubes are given on another page.

Coke.—The heavy reduction in output of coke and the advance in wages of very close to 10 per cent announced by the H. C. Frick Coke Company, and practically all the independent operators, have had the effect of making prices on coke somewhat firmer. There is nothing doing in contracts, coke makers believing that prices will be better later on, while furnace operators are not in a hurry about covering. There is still a good deal of question as to what course prices on coke will take in view of the large output of by-product coke that will come in the market, starting with June. We quote furnace coke for prompt shipment at \$2 for ordinary grades, and \$2.25 to \$2.40 for standard grades. On contracts some grades of coke are offered at less than \$2.50, but standard makes are held at \$2.50 to \$2.75. One leading maker states it would not sell under \$3. The Connellsville *Courier* gives the output of coke in the Connellsville region for the week ended April 29 as about 425,000 net tons, a decrease over the previous week of over 26,000 tons.

Old Material.—There is no change in the local scrap market, which continues quiet with prices weak. None of the large consumers is in the market, and with embargoes still on to Brackenridge and Johnstown, dealers are having trouble to find buyers for scrap that has to be moved. Reports are that the Carnegie Steel Company will soon be in the market for large quantities of heavy steel scrap, also borings and turnings, but this is not confirmed and may not be true. The fact that this company has not been a buyer of scrap for some time is mainly the reason for the severe decline in prices. There were no sales of moment during the past week. Dealers quote for delivery in the Pittsburgh and near-by districts that take the same rates of freight, per gross ton, as follows:

Heavy steel melting scrap, Steubenville, Hollansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	\$17.25 to \$17.50
No. 1 foundry cast	16.25 to 16.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	17.50 to 17.75
Hydraulic compressed sheet scrap	15.50 to 15.75
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	13.75 to 14.00
Bundled sheet stamping scrap	13.00 to 13.25
No. 1 railroad malleable stock	15.50 to 16.00
Railroad grate bars	12.50 to 12.75
Low phosphorus melting stock	20.50
Iron car axles	26.50 to 27.00
Steel car axles	26.00 to 26.50
Locomotive axles, steel	29.00 to 29.50
No. 1 busheling scrap	15.50 to 15.75
Machine shop turnings	10.25 to 10.50
Old carwheels	15.00 to 15.25
Cast-iron borings	10.25 to 10.50
*Sheet bar crop ends	18.00
No. 1 railroad wrought scrap	19.50 to 20.00
Heavy steel axle turnings	18.50 to 18.75
Heavy breakable cast scrap	14.50 to 14.75

*Shipping point.

Chicago

CHICAGO, ILL., May 9, 1916.

The relations between buyer and seller are now chiefly concerned with expediting the delivery of past due materials. Further buying of steel products is limited to filling in requirements and consists largely of the customer asking for what he wants and taking what a mill may have to offer. Characteristic of this miscellaneous activity are sales of from 100 to 200 tons of sheets in heavy gages, various sales of plates up to 300 tons, for prompt and third quarter shipment, small lots of rail-steel bars and, what is the exception, a purchase of a small quantity of structural steel for third quarter delivery, the price being 3.50c., Pittsburgh. For plates for shipment in July, August and September, 3.75c., Pittsburgh, has been paid by one of the largest buyers, who was able to secure but one-third of the amount desired. The railroads have very largely completed their buying program, but there remains some inquiry for rails in small lots and for track fastenings and there have been some sales, including 6300 tons of tie-plates at \$50. The inquiry of the Chicago & Northwestern for 4000 all-wood box cars is an interesting side-light upon the steel shortage. Activity in connection with pig iron has subsided and, with the closing of several thousand tons at the beginning of the week, there is left but little inquiry. Iron and steel scrap is in no better demand and prices for all grades are being steadily scaled downward.

Pig Iron.—The largest purchases of last week were of Southern iron, in which connection a basis of \$15, Birmingham, for iron analyzing 2.25 per cent and over in silicon, for last half delivery, was established. Sales of other Southern iron at even lower prices were made by interests holding warrants and speculative iron. Offerings of miscellaneous lots of iron, of analyses closely approximating standard gradings, are an important feature of the market and melters are filling in, to their own advantage and the postponement of contract shipments. Inquiry is again very limited for both Northern and Southern iron, but shipments from the furnaces are, as a rule, well up to schedule. Users of basic iron in the St. Louis district are inquiring for first half iron but as yet have found no favorable response from the furnaces. The local steel-making interest that has been a factor in the sale of basic is unlikely to have any further offerings for the last half. Prices remain as last quoted. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5.....	\$19.75
Lake Superior charcoal, No. 1.....	20.25
Lake Superior charcoal, No. 6 and Scotch.....	20.75
Northern coke foundry, No. 1.....	19.50
Northern coke foundry, No. 2.....	19.00
Northern coke foundry, No. 3.....	18.50
Southern coke, No. 1 f'dry and 1 soft.....	\$19.50 to 20.00
Southern coke, No. 2 f'dry and 2 soft.....	19.00 to 19.50
Malleable Bessemer.....	19.50
Basic.....	19.00 to 19.50
Low phosphorus.....	34.00 to 36.00
Silvery, 8 per cent.....	31.50
Bessemer ferrosilicon, 10 per cent.....	35.50

Rails and Track Supplies.—From traction lines and the lesser railroads there are a number of inquiries for rails in small lots and some few sales have been made. One of the large roads has been endeavoring to extend its contracts to cover an additional 20,000 tons, thus far without success. There remains to be bought a considerable quantity of track bolts and spikes but for the time being there is little inquiry. A sale of 6300 tons of tie-plates at the top price of \$50 at the mill was made last week. Coincident with the advance in the price of rails, the long standing quotation of 1.50c. for angle bars was advanced to 2c., base. We have revised our quotations as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, \$50, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago 1.47½c., base; open hearth, 1.56½c.; light rails,

25 to 45 lb., 1.80c.; 16 to 20 lb., 1.85c.; 12 lb., 1.90c.; 8 lb., 1.95c.; angle bars, 2c., Chicago.

Structural Material.—Of the contracts for fabricated steel reported last week, the largest called for 417 tons for Morris & Co., Chicago, taken by the Vierling Steel Works. The Northwest Steel Company was awarded 230 tons for wireless towers to be erected at Keyport, Wash., for the Government; the Decatur Bridge & Iron Company, 260 tons for the Illinois State Normal University building; the American Bridge Company, 200 tons for an Oliver Iron Mining Company shaft at Ironwood, Mich.; the Union Iron Works, 180 tons for a power station at Los Angeles, and the Hofius Steel & Equipment Company, 140 tons for steel towers for the Government at Cordova, Alaska. With respect to new material from mill, the situation is at a standstill. An Eastern mill has sold a small quantity for shipment in the third quarter on the basis of 3.50c., Pittsburgh. An indication of the status of the car situation is had in the purchase of 1000 30-ton all wood box cars from the American Car & Foundry Company by the Chicago & Northwestern Railroad, delivery to be made this fall. The inquiry was for 4000 cars. Other car inquiry is limited to the 300 underframes for the Rock Island, 300 stock cars for the Illinois Central and a like number of box cars for the San Pedro, Los Angeles & Salt Lake City. We quote nominally for contracts for structural steel from mill 2.689c., Chicago.

We quote for Chicago delivery of structural steel from jobbers' stock, 3.10c.

Plates.—The Baker Iron Works has taken a contract for 22,000 ft. of riveted steel pipe for Los Angeles, which will require 1000 tons of plates. Inquiry for plates in miscellaneous lots for prompt delivery continues active, the iron and steel jobbers being conspicuous because of their repeated purchases, frequently at prices in excess of selling quotations, out of stock. For third-quarter delivery as high as 3.75c. has been paid, and prompt shipment can scarcely be obtained at anything below 4c., Pittsburgh. We quote for Chicago delivery of plates from mill on contract the nominal price of 3.089c., and for prompt shipment 3.689c. to 4.189c.

We quote for Chicago delivery of plates out of jobbers' stock 3.50c.

Sheets.—Little or no difficulty is encountered in securing one-pass sheets, and the variations in price are indicative of the desire of makers for more of this business. While those mills which are dependent upon current purchases of sheet bars are unable to sell at less than 3.25c., Pittsburgh, without loss, some quotations range down to 2.90c. The better demand which has prevailed for heavy sheets still continues, and 3c., Pittsburgh, for Nos. 9 and 10 appears to be the minimum quotation. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.089c. to 3.189c.; box annealed, No. 17 and higher, 3.089c. to 3.189c.; No. 28 galvanized, 5.189c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.10c. to 3.20c.; No. 28 galvanized, 5.10c. to 5.50c.

Bars.—Mild-steel bars were reported sold last week at 3.50c., Pittsburgh, for prompt shipment, but 3c. can be done for ordinary requirements. Such buying of bars as is noted is largely for reinforced-concrete construction. The substitution of high-carbon bars for mild steel is assuming larger proportions, particularly among the implement interests. We quote, mill shipment, Chicago, as follows: Bar iron, minimum, 2.35c.; soft steel bars, 2.689c. nominal on contracts, 3.18c. for prompt shipment; hard steel bars, 2.50c. to 2.75c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

An especially strong demand for shafting out of stock is reported. We quote store prices for Chicago delivery: Soft steel bars, 3.10c.; bar iron, 3.10c.; reinforcing bars, 3.10c. base with 5c. extra for twisting in sizes 2 in. and over and usual card extras for smaller sizes; shafting 10 per cent above list.

Rivets and Bolts.—Contracts for bolts and nuts were closed last week by the Chicago, Milwaukee & St. Paul, Illinois Central and Santa Fé railroads, while the Rock

Island will doubtless close this week. Implement buying of bolts and nuts is largely completed. Recent sales of rivets have been made, in some instances at prices as high as 3.75c., but the market generally has not moved up to this figure. We quote carriage bolts up to $\frac{3}{8}$ x 6 in., rolled thread, 50-10-5; cut thread, 50-5; larger sizes, 40-5; machine bolts up to $\frac{3}{8}$ x 4 in., rolled thread, with hot pressed square nuts, 50-10-10; cut thread, 50-10; larger sizes, 40-10-5; gimlet point coach screws, 60; hot pressed nuts, square, \$2.90 off per 100 lb.; hexagon, \$2.90 off. Structural rivets, $\frac{3}{8}$ to 1 $\frac{1}{4}$ in., 3.50c. to 3.75c., base, Chicago, in carload lots; boiler rivets, 10c additional.

We quote out of store: Structural rivets, 3.50c.; boiler rivets, 3.60c.; machine bolts up to $\frac{3}{8}$ x 4 in., 60-10; larger sizes, 50-10; carriage bolts up to $\frac{3}{8}$ x 6 in., 60-5; larger sizes, 50 off; hot pressed nuts, square, \$3.25, and hexagon, \$3.25 off per 100 lb., lag screws, 65.

Cast-Iron Pipe.—Pending awards, which are expected to be made in the current week, include 300 tons at Middletown, Ohio, 300 tons of high-pressure pipe at Detroit, 500 tons at Elyria, Ohio, and 300 tons at Winterset, Kan. The leading interest will supply 150 tons for Mount Horeb, Wis. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$33.50 to \$34; 6 in. and larger, \$30.50 to \$31, with \$1 extra for class A water pipe and gas pipe.

Wire Products.—While the slowing up of demand for barb wire and fencing from the country districts is in part attributed to the high level of prices, the advancing season is also a factor in curtailing purchases. We quote as follows: Plain wire, No. 8 and coarser, base, \$2.639; wire nails, \$2.689; painted barb wire, \$2.839; galvanized barb wire, \$3.539; polished staples, \$2.839; galvanized staples, \$3.539, all Chicago.

Old Material.—The buying of steel and bundled sheet scrap for the mill at Kokomo, Ind., last week, though not in quantity sufficient, ordinarily, to call for comment, was conspicuous in contrast with the uninterested attitude of melters in general. Where prices are changed from a week ago the change is downward. For stove plate there is no demand with a consequent pronounced weakness. No. 1 wrought scrap, which had been holding steadily at \$17.25, has been bought at \$17, and the dealers are offering but \$16.50. The exceptionally low prices at which carwheels are being offered are even more extreme now than a week ago. It is stated that carwheels have been offered to brokers at \$12.35 per gross ton on track. The market is lacking in the one essential—buying interest on the part of consumers. Railroad offerings of scrap include 4500 tons by the Big Four, 2000 tons by the Soo, 2200 tons by the Milwaukee, 1000 tons by the Pere Marquette and 1000 tons by the Omaha. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	\$18.00 to \$18.50
Relying rails	19.50 to 20.50
Old carwheels	13.00
Old steel rails, rerolling	17.50 to 18.00
Old steel rails, less than 3 ft.	18.50 to 19.00
Heavy melting steel scrap	16.00 to 16.50
Frogs, switches and guards, cut apart	16.00 to 16.50
Shoveling steel	15.25 to 15.75
Steel axle turnings	11.00 to 11.50

Per Net Ton

Iron angles and splice bars	\$18.50 to \$19.00
Iron arch bars and transoms	19.75 to 20.25
Steel angle bars	15.50 to 16.00
Iron car axles	24.00 to 24.50
Steel car axles	26.50 to 27.00
No. 1 railroad wrought	16.75 to 17.25
No. 2 railroad wrought	15.25 to 15.75
Pipes and flues	12.25 to 12.75
No. 1 busheling	13.75 to 14.25
No. 2 busheling	9.75 to 10.25
Cut forge	15.25 to 15.75
Steel knuckles and couplers	15.50 to 16.00
Steel springs	16.00 to 16.50
No. 1 boilers, cut to sheets and rings	11.25 to 11.75
Boiler punchings	14.00 to 14.50
Locomotive tires, smooth	19.50 to 20.00
Machine shop turnings	7.00 to 7.25
Cast borings	7.00 to 7.50
No. 1 cast scrap	12.50 to 13.00
Stove plate and light cast scrap	10.50 to 11.00
Grate bars	10.75 to 11.00
Brake shoes	11.00 to 11.25
Railroad malleable	13.50 to 14.00
Agricultural malleable	11.25 to 11.75

Philadelphia

PHILADELPHIA, PA., May 9, 1916.

Plates continue to be far more active than shapes and bars, and because of the higher price they command preference is given to their production by mills which are not exclusively plate mills. Most of the latter are quoting 4.159c., Philadelphia, for deliveries at their convenience, although 3.909c. is still quoted by one eastern Pennsylvania mill. There is a heavy export demand for round-cornered billets in the larger sizes, whereas the domestic demand for billets is not so urgent as it was. Structural material continues in good demand, and prices, of course, are exceedingly firm. The rail business subsided to a great extent with the end of April. The week has been a quiet one in pig iron, which has given the sellers time to recount the large orders they have on their books. Quotations continue firm. There is a surplus of old material everywhere, consequently little interest has been shown in it and prices show a tendency to sag. In ferroalloys there has not been much doing, and while the report persists that spot ferromanganese is easier, it is not everywhere accepted.

Pig Iron.—The market has continued quiet, but the condition is not one to incite any uneasiness on the part of producers or sellers in view of the large volume of orders which will keep furnaces busy for months. One interest is so well booked up with orders for foundry iron that it is practically oversold and may switch a furnace now on basic over to foundry iron. The numerous strikes in various parts of the country have so far exerted little or no influence in this vicinity, and the trade here is more concerned with the freight embargoes which again have shut New England off from the rest of the world so far as pig iron and many other commodities go. Eastern Pennsylvania No. 2 X is firm at \$20.50 to \$21, Philadelphia, with little being done at the top of the range. The quotations for other grades are likewise unchanged. Quotations for standard brands, delivered in buyer's yards, prompt shipment, range about as follows:

Eastern Pa., No. 2 X foundry	\$20.50 to \$21.00
Eastern Pa., No. 2 plain	20.25 to 20.75
Virginia, No. 2 X foundry	21.25
Virginia, No. 2 plain	20.75
Gray forge	19.50
Basic	20.50 to 21.00
Standard low phosphorus	34.00 to 35.00

Iron Ore.—Arrivals at this port in the week ended May 6 consisted of 9753 tons from Sweden and 6244 tons from Spain. That next winter may see a shortage in the supply of ore is a growing belief, and already it is being suggested that consumers should accept every shipment offered between now and that time.

Ferroalloys.—The situation is but little changed, if at all. The market is quiet and there is little to indicate any change in prices, although the feeling persists that spot 80 per cent ferromanganese is easier. The nominal quotation for last quarter is \$200, seaboard, and for first half, \$175. It is reported that July and August of domestic manufacture has been quoted at \$210, and that small quantities of spot have sold for \$350. On the other hand, \$400 and over is quoted for spot. Last week arrivals of 80 per cent English ferromanganese at this port totaled 998 tons. Contract 50 per cent ferrosilicon is unchanged at \$83 to \$85, Pittsburgh, according to quantity. Spot is scarce and commanding a premium of at least \$7 per ton. Bessemer ferrosilicon is quoted at \$36.44, Philadelphia, for 10 per cent and \$37.44 for 11 per cent.

Plates.—Makers of plates are being deluged with specifications and some of them will be unable to fulfill their commitments. So eager are some consumers for material that they are offering substantial premiums for deliveries in two and three months. One maker reports that some second quarter contracts are already exhausted, and that he has no desire to make new ones. The demand is miscellaneous, with the railroads specifying heavily for their locomotive and car requirements. The larger mills are quoting 4c., Pittsburgh, or 4.159c., Philadelphia, as their minimum, but one

maker's minimum is 3.75c., Pittsburgh, or 3.909c., Philadelphia, delivery in eight to ten weeks.

Steel Rails.—Following the large purchases announced at the end of April, demand has tapered off, but there is still some live inquiry before the trade.

Bars.—There is no change in the steel-bar situation. The mills are not seeking new business, and the nominal quotation is 2.909c., Philadelphia. The makers of iron bars quote 2.659c., Philadelphia, carload lots.

Structural Material.—The miscellaneous demand for structural shapes continues to tax the mills, one of which quotes a minimum of 3.159c., Philadelphia. Another mill, which is avoiding fresh bookings, quotes 3.50c., Pittsburgh, or 3.659c., Philadelphia. The question is asked—why sell shapes at 3c., when plates command 4c.? Philadelphia jobbers quote 3.35c., f.o.b., Philadelphia, for shapes from stock, and many of them are short of material. The Pennsylvania Railroad has made inquiry for about a dozen bridges.

Billets.—Inquiry is heavy for round-cornered billets for export, and particularly for large sizes. Domestic consumers are well covered by contracts, and new business from that direction is not so urgent as it was. Open-hearth rerolling billets are unchanged at \$50 to \$55, and forging billets at \$65 to \$70.

Sheets.—The specifications for sheets are unlesioned in volume. No. 10 blue annealed is quoted at 3.909c. to 4.159c., Philadelphia.

Coke.—Furnace coke is rather firmly held at about \$3 per net ton at oven for contract, and \$2.25 to \$2.50 for spot, the latter prices almost being subject to daily changes. Contract foundry ranges from \$3.65 to \$3.75 per net ton at oven, and spot at \$3.50 to \$3.75. Some of the larger producers continue out of the market. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

Old Material.—There is no market for turnings, and in fact there is but little interest in any grade of scrap. Cast borings are weaker. It is everywhere admitted that an overabundance of material is available. Some low phosphorus crop ends for early delivery have sold at \$24. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania, and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$17.00 to \$17.50
Old steel rails, rerolling.....	19.00 to 20.00
Low phos. heavy melting steel scrap.....	22.50 to 23.25
Old steel axles.....	26.00 to 27.00
Old iron axles.....	28.00 to 29.00
Old iron rails.....	20.00 to 20.50
Old carwheels.....	17.00 to 17.50
No. 1 railroad wrought.....	23.00 to 23.50
Wrought-iron pipe.....	14.00 to 14.50
No. 1 forge fire.....	15.00 to 15.50
Bundled sheets.....	15.00 to 15.50
No. 2 busheling.....	11.00 to 11.50
Machine shop turnings.....	10.00 to 10.50
Cast borings.....	10.00 to 10.50
No. 1 cast.....	17.50 to 18.00
Grate bars, railroad.....	13.50 to 14.00
Stove plate.....	13.50 to 14.00
Railroad malleable.....	14.50 to 15.00

Cincinnati

CINCINNATI, OHIO, May 10, 1916.—(By Wire.)

Pig Iron.—A near-by consumer has bought a round tonnage of Southern basic for shipment in the last quarter of this year and through the first part of next year. It is reported that this order was about equally divided between two Southern producers. Foundry iron has been sold in small lots for this year's shipment, but only a comparatively limited amount has been purchased for the first half of 1917. Southern No. 2 foundry is quoted at \$15, Birmingham basis, for second quarter shipment and at \$15.50 for last half. Some business at \$15 has been booked for deliveries extending to Jan. 1. A few orders have been taken at \$16, Birmingham, for the first half, but \$15.50 can be done on a few brands. Northern iron is firm at \$19, Ironton, for this year's shipment, but some resale iron is still on the market below this figure. Present prompt shipment quotations for both Northern and Southern iron are said to be obtainable on first half contracts. Open in-

quiries are scarce, but a central Ohio firm is expected to close this week for 1200 tons of mixed Northern and Southern foundry for first half delivery. An Indiana firm will also take 500 tons of Southern iron. Lake Superior charcoal iron has been in better demand, and 1000 tons was sold to an Indiana melter and 500 tons to an Ohio consumer, both for first half shipment and at present market quotations. The Ohio silvery irons are quiet, and \$29 at furnace is still the price mentioned, but it has not been firmly established. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$18.40 to \$18.90
Southern coke, No. 2 f'dry and 2 soft.	17.90 to 18.40
Southern coke, No. 3 foundry.....	17.40 to 17.90
Southern gray forge.....	16.90 to 17.40
Ohio silvery, 8 per cent silicon.....	16.40 to 16.90
Southern Ohio coke, No. 1.....	28.26 to 28.76
Southern Ohio coke, No. 2.....	21.26
Southern Ohio coke, No. 3.....	20.26
Southern Ohio malleable Bessemer.....	19.76
Basic, Northern.....	20.26
Lake Superior charcoal.....	22.20
Standard Southern carwheel.....	25.40 to 25.90

(By Mail)

Finished Material.—The warehouse price on wire nails has been advanced generally to \$2.75 per keg, base, and on barb wire to \$3.60 per 100 lb. Local jobbers are having no trouble now in filling orders from retailers, but those who have no large stocks on hand are somewhat apprehensive as to getting prompt shipments later on old contracts. The demand for different kinds of wire goods, such as netting, screen doors, etc., is very good. Reinforcing concrete bars are also wanted and the present prices have not cut down this branch of the business to any considerable extent. The larger sized structural shapes are scarce, and beams and channels from stock bring very good prices. We quote No. 10 blue annealed sheets from jobbers' stock at 3.50c.; plates, 3.50c.; small structural shapes, 3.20c. The mill price of No. 28 galvanized sheets is 5.15c. to 5.20c., Cincinnati or Newport, Ky., and No. 28 black sheets from 3.15c. to 3.25c. Railroad track material is slow.

Coke.—Furnace coke is very quiet and no large contracts have been made in this territory recently. The cessation of activities by a number of furnaces that have blown out for relining has cut off the demand for prompt furnace coke. Prices are unchanged and we quote Connellsville 48-hr. coke around \$2.25 to \$2.50 per net ton at oven; Wise County and Pocahontas furnace grades are approximately 25c. per ton above these figures. Foundry coke is also slow, few sales for either prompt or future shipments having been made recently. Connellsville, Wise County and Pocahontas 72-hr. coke is quoted at \$3.50 to \$3.75 per ton at oven, but New River foundry coke is held around \$4 to \$4.25.

Old Material.—The market is dragging and prices on all kinds of scrap are soft. Some small reductions have been made. Contracts are limited, while offerings are heavy. The minimum figures given below represent what dealers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards.

	Per Gross Ton
Bundled sheet scrap.....	\$12.00 to \$12.50
Old iron rails.....	16.00 to 16.50
Rerailing rails, 50 lb. and up.....	21.25 to 21.75
Rerolling steel rails.....	15.00 to 15.50
Heavy melting steel scrap.....	14.25 to 14.75
Steel rails for melting.....	13.50 to 14.00

	Per Net Ton
No. 1 railroad wrought.....	\$13.50 to \$14.00
Cast borings.....	5.75 to 6.25
Steel turnings.....	5.75 to 6.25
Railroad cast scrap.....	11.25 to 11.75
No. 1 machinery scrap.....	13.00 to 13.50
Burnt scrap.....	8.25 to 8.75
Iron axles.....	19.75 to 20.25
Locomotive tires (smooth inside).....	17.25 to 17.75
Pipes and flues.....	9.75 to 10.25
Malleable and steel scrap.....	11.00 to 11.50
Railroad tank and sheet scrap.....	8.75 to 9.25

The Tropenas Converter Company has discontinued its office at 50 Church Street, New York, and hereafter all business will be transacted from its main office at 2243 Nostrand Avenue, Brooklyn, N. Y.

Cleveland

CLEVELAND, OHIO, May 9, 1916.

Iron Ore.—There was less iron ore on Lake Erie docks May 1 than on the same date since 1907. The amount just reported was 3,311,399 tons, as compared with 5,897,721 tons on May 1, 1915. Estimates made early in the year indicated that ore stockpiles would be reduced close to 3,000,000 tons on May 1. Of the total April shipments of 1,658,411 gross tons from the upper lake ports, 409,373 tons was received at Lake Erie ports and 289,824 tons at Lake Michigan and other ports, most of that shipped in the last few days of the month not having reached port. It is probable that the May movement will break all records for the month. We quote prices as follows, delivered lower lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; old range non-Bessemer, \$3.70; Mesaba non-Bessemer, \$3.55.

Pig Iron.—The market is extremely dull. Foundries in this territory are showing no disposition to buy iron for next year's delivery at prevailing prices, and there have been practically no recent sales for that shipment. Sellers are not making efforts to book orders for next year, although the recent price concessions in the Buffalo territory for first-half delivery indicated that furnaces there were willing to take on some tonnage and for first half at lower than current prices for a backlog. Shipments are heavy, being equal to or in excess of production, and reports indicate stocks in most furnace yards have become quite low. Prices on foundry grades in Cleveland are unchanged, one seller still quoting \$18.50 for No. 2 for out-of-town shipment. Southern iron is inactive, with prices unchanged at \$15 for early shipment, and \$15.50 for contracts through the last half and the first half of next year. Corrigan, McKinney & Co. expect to light their new No. 3 stack in Cleveland to-morrow. At present this firm is consuming the entire output of two stacks in its steel plant, and with the blowing in of its No. 4 stack during the summer will be in the same position in the market as it was before the starting up of its steel plant, in that it will dispose of the output of two of its furnaces in the market. We quote, delivered Cleveland, as follows:

Bessemer	\$21.95 to \$22.45
Basic	19.00 to 19.30
Northern No. 2 foundry	19.30 to 19.80
Southern No. 2 foundry	19.00 to 19.50
Gray forge	18.75
Jackson Co. silvery, 8 per cent silicon	30.62
Standard low phos., Valley furnace	32.00

Coke.—The market is very quiet, and prices on foundry grades are not as firm as they have been. Shipments are now good, and there is practically no call for foundry coke for prompt shipment. We quote Standard Connellsville foundry coke at \$3.25 to \$3.50 per net ton, at oven, for prompt shipment and contract. Connellsville furnace coke is held at \$2 to \$2.25, at oven, for early shipment.

Finished Iron and Steel.—The new demand is only moderate, but mill agencies report they could book a great deal of tonnage in contracts were they able to take on additional business. Some inquiry has come out for bar contracts for first half of next year on which mills have declined to quote prices. Manufacturers in this territory are figuring on a number of inquiries for high explosive shells in 6, 6½ and 8 in. sizes, mostly English specifications, and have inquiries out for approximately 35,000 tons or more of shell steel for various deliveries, but it is not known if any of these shell orders have actually been placed. The demand for plates continues active, quotations ranging from 3.50c. to 4.50c., Pittsburgh, for early shipment. New demands for structural material are not active. The American Bridge Company has taken 1500 tons for a plant extension for the B. F. Goodrich Company, Akron, Ohio, and a new plant to be erected by the Grant Motor Car Company, Cleveland, will require 400 tons. There is a good demand for shafting, which is very scarce for early delivery, and buyers are depending largely on warehouse stocks. Shafting sales from warehouses are being made at as high as 20 and 25 per cent plus.

Sheets continue fairly active with little change in prices. We quote sheets at 3c. to 3.25c., Ohio mill, for No. 28 black; 2.90c. to 3c. for No. 10 blue annealed and 4.90c. to 5.25c. for No. 28 galvanized. Prices on hard steel bars are irregular. One mill is reported to be placing contracts for last half at about 2.50c. delivered. The Interstate Iron & Steel Company will start up its new rerolling mill at Marion, Ohio, May 15. Iron bars are quoted at 2.50c., Pittsburgh. We quote warehouse prices at 3.25c. for steel bars and structural material, 3.65c. for plates and 3.20c. for iron bars.

Bolts, Nuts and Rivets.—Jobbers have large stocks of bolts and nuts, and are making sales at prices lower than the present manufacturers' prices, and in addition are able to make prompt deliveries. There is a moderate volume of contracts for third quarter, and some makers are covering jobbers with contracts for that delivery. Some additional contracts for boiler rivets are being placed for third and fourth quarters, those for the latter delivery being on the basis of 4.10c., Pittsburgh. For third quarter delivery we quote structural rivets at 3.75c., Pittsburgh, and boiler rivets at 3.85c. for carload lots. Bolt and nut discounts are as follows:

Common carriage bolts, $\frac{1}{4}$ x 6 in., smaller or shorter, rolled thread, 50, 10 and 5; cut thread, 50 and 5; larger or longer, 40 and 5; machine bolts with h. p. nuts, $\frac{1}{4}$ x 4 in., smaller and shorter, rolled thread, 50, 10 and 10; cut thread, 50 and 10; larger and longer, 40, 10 and 5; lag bolts, gimlet or cone point, 60; square h. p. nuts, blank or tapped, 2.90 off the list; hexagon, h. p. nuts, blank or tapped, \$2.90 off; c. p. c. and t. square nuts, blank or tapped, \$2.60; hexagon nuts, all sizes, 83 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 10.

Old Material.—The market continues dull, and further declines in prices are noted on several grades. Prices have now sagged to such an extent that dealers feel they are not likely to go lower at present, and are offering little material except that on track. A local mill has taken on some heavy melting steel at \$16.50, and a Massillon mill is reported to have purchased 2000 or 3000 tons at \$17.50. For Youngstown delivery heavy steel scrap is quoted at \$17 and \$17.25. The New York Central Railroad is reported to have sold its heavy melting steel scrap from its Lake Shore division last week to a Buffalo mill at about \$18 delivered. The Wheeling & Lake Erie Railroad sold a round lot of steel axles at \$28.15, Toledo, for export. An embargo has been declared against the Upson Nut Company. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Old steel rails	\$16.00 to \$16.25
Old iron rails	19.00
Steel car axles	28.00 to 29.00
Heavy melting steel	16.25 to 16.50
Old carwheels	13.50 to 13.75
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	14.00 to 14.25
Railroad malleable	17.00 to 17.25
Steel axle turnings	13.00 to 13.25
Light bundled sheet scrap	13.00 to 13.25

Per Net Ton	
Iron car axles	\$23.00 to \$24.00
Cast borings	7.50
Iron and steel turnings and drillings	7.50
No. 1 busheling	14.00 to 14.50
No. 1 railroad wrought	17.00 to 17.50
No. 1 cast	14.00 to 14.25
Railroad grate bars	11.75 to 12.00
Stove plate	11.25 to 11.50

St. Louis

ST. LOUIS, MO., May 8, 1916.

Pig Iron.—Some increase of activity is noted in buying and sales included one of 2000 tons of No. 2 and No. 3 Southern foundry with delivery for the first half of 1917, 500 tons of No. 3 Southern for last half of 1916, 700 tons of No. 2 Southern and 300 tons of No. 3 Southern foundry; also 500 tons of No. 2 Northern foundry. Prices are firm, but show no change from last quotations.

Coke.—Business was altogether in very small lots for immediate needs at prices above the general market. By-product coke, of local and nearby production, is quoted in parallel with Connellsville coke.

Finished Iron and Steel.—There has been an increasing tendency to draw on warehouse stocks as a result of the deferred deliveries on contracts. Fabricators

have filled their yards as far as contracts will permit, but not finding their supplies broad enough to meet requirements are paying the higher warehouse prices. Specifications against contracts for track fastenings are ahead of allotments under the contracts. For material out of warehouse we quote as follows: Soft steel bars, 3.15c.; iron bars, 3.10c.; structural material, 3.15c.; tank plates, 3.55c.; No. 10 blue annealed sheets, 3.45c.; No. 28 black sheets, cold rolled, one pass, 3.30c.; No. 28 galvanized sheets, black sheet gage, 5.60c.

Old Material.—Scrap has firmed up considerably. Though embargoes at mills are still in force, their stocks are reaching a point where additional scrap will shortly be needed. Inquiry for relaying rails is still very active, with supplies very hard to get. Railroad lists put out during the week include 5000 tons from the Southern, 1200 tons from the Vandalia, 4000 tons from the Big Four, 2500 tons from the Chicago, St. Paul, Minneapolis & Omaha, 500 tons from the Mobile & Ohio and 200 tons from the Kansas City Southern. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

<i>Per Gross Ton</i>		
Old iron rails	\$17.00 to \$17.50	
Old steel rails, re-rolling	17.00 to 17.50	
Old steel rails, less than 3 ft.	16.50 to 17.00	
Relaying rails, standard section, subject to inspection	22.00 to 23.00	
Old carwheels	12.75 to 13.25	
No. 1 railroad heavy melting steel scrap	15.50 to 15.75	
Heavy shoveling steel	13.25 to 13.50	
Frogs, switches and guards cut apart	15.25 to 15.50	
Bundled sheet scrap	9.00 to 9.50	
<i>Per Net Ton</i>		
Iron angle bars	\$16.00 to \$16.50	
Steel angle bars	13.50 to 14.00	
Iron car axles	23.50 to 24.00	
Steel car axles	25.50 to 26.00	
Wrought arch bars and transoms	19.25 to 19.75	
No. 1 railroad wrought	16.00 to 16.25	
No. 2 railroad wrought	15.50 to 15.75	
Railroad springs	14.75 to 15.00	
Steel couplers and knuckles	14.25 to 14.50	
Locomotive tires, 42 in. and over, smooth inside	18.75 to 19.25	
No. 1 dealers' forge	12.00 to 12.50	
Cast borings	8.00 to 8.25	
No. 1 busheling	13.50 to 14.00	
No. 1 boilers, cut to sheets and rings	9.25 to 9.75	
No. 1 railroad cast scrap	12.00 to 12.50	
Stove plate and light cast scrap	9.00 to 9.50	
Railroad malleable	11.25 to 11.75	
Agricultural malleable	10.25 to 10.75	
Pipes and flues	10.50 to 11.00	
Railroad sheet and tank scrap	9.75 to 10.25	
Railroad grate bars	9.00 to 9.50	
Machine shop turnings	8.50 to 8.75	

Birmingham

BIRMINGHAM, ALA., May 8, 1916.

Pig Iron.—One furnace interest has sold several lots aggregating 1500 tons for prompt shipment, and lapping over into the second quarter at \$15.50, the largest transaction being around 500 tons. For strictly prompt shipment \$15 is the one price and no makers are selling under that figure, resale offerings not appearing to have affected them. Stocks are reported as remaining about stationary in spite of the record-breaking April production, with its increase of 85,000 tons over April, 1915. One of the largest producers of foundry is somewhat an exception to the prevailing easing off, its sales being around its make. One lot of 5000 tons of mixed grades for Northwestern delivery for second half brought \$15.50. It is known that warrant iron has been offered under the market, but, in spite of that, comparatively little resale business is reported. The matter of caring for storage, if the metal is not used at once, figures in transactions. The cash basis also has to do with slowness in this movement. However, it is a fact that Eastern holders of warrants have offered a fair tonnage at \$14.50. Plans for the utilization of the long idle Trussville stack, in connection with concentrated ore and the manufacture of by-products, are under consideration by two interests. Other parties have had reports made on the condition of the Williamson furnace in Birmingham, with an idea of making ferromanganese. Nothing of a definite nature has developed in either connection. Local officials of the Alabama and Gulf States companies join Charles M. Schwab, of the Bethlehem Steel Company, in dis-

countenancing rumors of the absorption of the first two by the last-named concern. Both these Alabama concerns have been operated with marked success since their reorganization under James Bowron for the Gulf States and H. W. Coffin and W. E. Leake for the Alabama. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	\$15.50 to \$16.00
No. 2 foundry and soft	15.00 to 15.50
No. 3 foundry	14.50 to 15.00
No. 4 foundry	14.25 to 14.75
Gray forge	14.00 to 14.50
Basic	15.00 to 15.50
Charcoal	22.50 to 23.00

Cast-Iron Pipe.—The leading maker reports only an ordinary aggregate of new business. Another pipe company has received a number of orders from Texas, Nebraska, Iowa and other Western States and reports a generally active buying movement, which, although not marked by large specifications, is of good volume. A. H. Campbell and others have completed the organization with \$75,000 capital, of the National Pipe & Foundry Company at Gadsden, which will build a sanitary pipe shop. Two makers name \$29 and \$26 as the prices per net ton for 4-in. and 6-in. and upward, f.o.b. shops, but one other quotes \$28 and \$25. One dollar is to be added for gas pipe and 16-ft. lengths.

Coal and Coke.—Not much is to be said about coal, which is better in the prospect than in present. Coke seems likely to remain strong for some time at the prevailing quotations of \$4.25 to \$4.50 per net ton, f.o.b. oven, for handpicked beehive foundry, with furnace coke at \$3.25 to \$3.50. The disappearance of foreign coke in coast markets has been quite a stimulus to the Birmingham product. The Sloss-Sheffield will repair the Sayre Mining Company's beehive plant, which it has leased, and then resume operations.

Old Material.—The market has been easing off in several particulars, but wrought-iron and steel scrap remain active, with prices well maintained. Difficulty has been encountered in securing cars for shipments to Ohio and other foundry centers, which use much Birmingham material. We quote, per gross ton, f.o.b. Birmingham district yards, as follows:

Old steel axles	\$18.00 to \$19.00
Old steel rails	12.00 to 12.50
No. 1 steel scrap	11.25 to 11.75
No. 1 wrought scrap	14.50 to 15.00
No. 1 cast scrap	11.00 to 11.50
Heavy cast scrap	9.50 to 10.00
Stoveplate and light	10.00 to 10.50
Old carwheels	12.00 to 12.50
Tram carwheels	10.50 to 11.00

New York

NEW YORK, May 10, 1916.

Pig Iron.—It has been one of the quietest weeks of the year. Local pig-iron offices have probably 5000 to 7500 tons of inquiry before them, probably more than half of it in lots under 500 tons. In a number of instances sales have been made for delivery in the first quarter and first half of 1917 at prices below those asked for the second half of this year. A Pennsylvania furnace, for example, has sold at \$18.50 for 1917 delivery, whereas it has been asking \$19 for this year. Some Buffalo furnaces in the recent buying movement went as low as \$18.50 on No. 2 X iron, though \$19 to \$19.50 has been considered the general range in that district. Charcoal iron has been figuring to a somewhat greater extent than usual in the purchases of the year, a number of foundries making castings calling for strength or special density having taken charcoal iron for 10 to 15 per cent of their mixtures. The Pennsylvania Railroad restored its embargo on April 30 against New England railroads. The Lehigh Valley and Erie took similar action. The D. L. & W. has embargoed shipments to New England via Hoboken, but is open to New England points except Waterbury, Hartford and Torrington via Poughkeepsie bridge. The situation has been aggravated by the strike of tugboat engineers in New York harbor. The labor situation at some furnaces is indicated by the fact that quotations are appearing on unbroken pig iron. We quote at tidewater for early delivery: No. 1

foundry, \$21 to \$21.25; No. 2 X, \$20.50 to \$20.75; No. 2 plain, \$20.25 to \$20.50; Southern iron at tidewater, \$20.75 to \$21 for No. 1 and \$20.25 to \$20.50 for No. 2 foundry and No. 2 soft.

Ferroalloys.—The ferromanganese market is very quiet, with both spot and contract demand less than in many weeks. Sales of a few lots of 80 per cent alloy at \$400 are noted, as well as of some lower content material at the rate of \$5.60 per unit. It is believed that an urgent demand could be satisfied at less than \$400. While a few small sales are made for delivery in the first half of 1917 at \$175, seaboard, this demand is apparently nearly satisfied. There are still no inquiries for material for delivery beyond July 1, 1917, though British makers are willing to sell thus far ahead. Some standard British alloy has been sold at \$210, seaboard, for the last half of this year, and more is available at that figure as well as at \$200, seaboard, for last quarter. Further shipments of Cuban manganese ore are expected to arrive here very soon. Spiegeleisen is quiet at \$60 to \$65, furnace, for last half. The demand for 50 per cent ferrosilicon is insistent, but the supply is not abundant. Consumers under contract at \$83 to \$85, Pittsburgh, are being fairly well taken care of, and some small lots have sold from \$90 to \$100 for early delivery.

Structural Material.—While well occupied for three months, fabricators are actively canvassing for work, which fact may be taken as a sign of diminishing prospects for the future. Railroad offerings continue active. The Pennsylvania, for example, is in the market for 2500 tons additional bridge work, and has closed for 1800 tons, awarded to the Phoenix Bridge Company. The New York subway work mentioned last week is, of course, a factor. The Midvale Steel & Ordnance Company is expected shortly to close for the 3500 tons for the ordnance shops at Nicetown, Philadelphia, and for perhaps 500 tons for machine shops for the Worth plant at Coatesville. Loft and similar buildings continue active, with 700 tons for a Bing & Bing building closed with the Passaic Structural Steel Company, and an 800-ton apartment for Klein & Jackson, Madison Avenue and Seventy-second Street, and the Carpenter apartment, Park Avenue and Sixty-second Street, 1500 tons, up for figures. The Evergreen telephone exchange, Ridgewood, Brooklyn, 350 tons, is a new offering, while the Lev-Gar Structural Company is to erect the 1100-ton Southern New England Telephone building, New Haven. Other steel structures include the St. Thomas School, Brooklyn, 350 tons, and a bridge for the New Haven, 200 tons. Plain material in a number of weeks brings 2.70c. to 3c., Pittsburgh, and we quote mill shipments at 2.769c. to 3.169c., New York, depending on urgency of delivery. From store an attractive lot may be obtained at 3.25c., New York, but as high as 3.50c., New York, is regularly obtained.

Steel Plates.—Though large lots, chiefly for export, are pressing on the makers, only small lots receive consideration for anything like early delivery. The attitude of the mills is thus that demand is going to continue so long that no advantage is to be gained by tying up capacity on large contracts. Round lots offered at 3.50c., Pittsburgh, for third quarter have been refused. The price is now firm at 4.169c., New York, for delivery in third quarter, and little below 3c. Pittsburgh, or 3.169c., New York, for any delivery. Out of store plates are 4.25c. to 4.50c., New York, not all of the warehouses making the advance of May 2.

Iron and Steel Bars.—With greater frequency than has obtained in recent months one hears of offerings by mills of steel bars, and one case of a sale of 1000 tons of Bessemer bars to a jobber is claimed at 3.50c., Pittsburgh, for delivery in two to five months. It appears that the agricultural implement makers are now all covered for the last half and apparently at about \$45 per ton. Many other manufacturing consumers are as yet unprotected, at least for the last quarter, and this fact works, of course, for the strength of market prices. Demand for bar iron shows no let up, and inquiries continue for material for first half of 1917,

chiefly for track accessories. For mill shipments of steel bars we quote 2.769c. to 2.919c., New York, for deferred delivery, and about 3.169c., New York, for prompt delivery, except from warehouse, which asks 3.25c. to 3.50c., New York, for iron and steel bars. Mill shipments of iron bars are strong at 2.669c., New York.

Cast-Iron Pipe.—Municipal lettings are disappointingly few. The city of Poughkeepsie, N. Y., will open bids May 18 on about 2000 tons. Private buying, however, appears to be making up to a great extent for the slackness in purchases by municipalities, as the demand is continuously good. Prices are well maintained. Carload lots of 6-in., class B and heavier, are quoted at \$30.50 per net ton, tidewater, class A and gas pipe taking an extra of \$1 per ton.

Old Material.—Old steel axles and relaying rails are in active demand, but other classes of old material are neglected and weak. The Pittsburgh demand on Eastern sources of supply has subsided, and prices of heavy melting steel scrap at Pittsburgh are now about on a level with prices in eastern Pennsylvania. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

No. 1 heavy melting steel scrap (railroad or equivalent)	\$15.25 to \$15.50
Heavy steel scrap (Eastern Pa. specifications)	14.75 to 15.00
Relying rails	27.50
Rerolling rails	16.75 to 17.25
Iron car axles	26.50 to 27.00
Steel car axles (for domestic use)	28.00 to 28.50
Steel car axles (for export)	31.00 to 32.00
No. 1 railroad wrought	21.50 to 22.00
Wrought-iron track scrap	18.50 to 19.00
No. 1 yard wrought, long	16.50 to 17.00
No. 1 yard wrought, short	15.25 to 15.50
Light iron	6.00 to 6.50
Cast borings (clean)	8.25 to 8.50
Machine shop turnings	8.25 to 8.50
Mixed borings and turnings	8.00 to 8.25
Wrought pipe	12.00 to 12.50
Old carwheels	16.00 to 16.50
Malleable cast (railroad)	12.75 to 13.25

Cast scrap is quiet. Quotations to consumers are unchanged as follows, per gross ton, New York:

No. 1 cast (machinery)	\$17.50 to \$18.00
No. 2 cast (heavy)	16.00 to 16.50
Stove plate	12.00 to 12.50
Locomotive grate bars	12.00 to 12.50

Buffalo

BUFFALO, N. Y., May 9, 1916.

Pig Iron.—There has been no general buying the past week, although a portion of the unfilled inquiry has been taken. Only small orders are now coming in. Statistically, the market is strong and growing stronger. The top notch of blast-furnace production has been reached here, and makers are sold up practically solidly for a considerable period ahead, providing the labor situation permits the operation of melters' plants to normal capacity. Many small foundries are increasing their output—in some instances, from 200 to 600 per cent over ordinary times, with a proportionate increase in the ordering of pig iron, which offsets to some extent the lull in large buying. While one of the large selling interests has shaded prices on some grades, in a few instances, others are firm. We quote as follows, for current and last half delivery, f.o.b. furnace, Buffalo:

No. 1 foundry	\$19.50 to \$20.00
No. 2 X foundry	19.00 to 19.50
No. 2 plain	18.75 to 19.00
No. 3 foundry	18.75 to 19.00
Gray forge	18.50 to 19.00
Malleable	19.00 to 20.00
Basic	19.50 to 20.00
Bessemer	21.00 to 22.00

Finished Iron and Steel.—Little new business is being booked as mills are in such filled up condition that only small amounts of material can be rolled beyond contracts already placed for 1916. Inquiries for wire rods have been quite heavy, but mills are able to accept only small orders even at the advanced prices. Tin plate also shows a heavy demand at the new price of \$5.50 per base box. The John W. Cowper Company, this city, has the general contract for the erection of

seven additional buildings at the plant of the Schoellkopf Aniline & Chemical Works, taking 2500 tons of structural steel and a considerable quantity of concrete reinforcing bars. The steel contracts have not yet been subtlet. The Buffalo Structural Steel Company has the contract for the steel for two elevators to be erected on the Buffalo River by the Monarch Engineering Company, each taking about 200 tons. The Corrugated Bar Company, Buffalo, has the concrete reinforcing bars for these structures—about 500 tons. The Buffalo Structural Steel Company also has contracts for steel for two buildings, each taking about 100 tons, and 150 tons for plant addition for the Union Carbide Company, Sault Ste. Marie, Mich.

Old Material.—The price for heavy melting steel, which went up, temporarily, last week, has fallen back. Low phosphorus steel also shows a drop, and the prices of a number of other commodities have softened. The demand has not kept pace with production, which is very large, and only small sales have been made in any line. Dealers believe the present inactivity will be of short duration and are not disposed to sell more than small lots at the lower prices now current. We quote dealers' asking prices per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel.....	\$17.00 to \$17.50
Low phosphorus steel.....	20.00 to 20.50
No. 1 railroad wrought scrap.....	19.00 to 19.50
No. 1 railroad and machinery cast scrap	16.00 to 16.50
Old steel axles.....	24.00 to 24.50
Old iron axles	24.00 to 24.50
Old carwheels	14.50 to 15.00
Railroad malleable	15.50 to 16.00
Machine shop turnings	8.00 to 8.50
Heavy axle turnings	12.00 to 12.50
Clean cast borings	9.25 to 9.75
Old iron rails	18.00 to 18.50
Locomotive grate bars	12.00 to 12.50
Stove plate (net ton).....	11.50 to 12.00
Wrought pipe	14.00 to 14.50
Bundled sheet scrap	12.50 to 13.00
No. 1 busheling	14.50 to 15.00
No. 2 busheling	11.50 to 12.00
Bundled tin scrap	15.00 to 15.50

British Steel Market

American Manufacturers Much Behind on Shipments—Exports Curtailed

(By Cable)

LONDON, ENGLAND, May 10, 1916.

The Cleveland pig-iron shortage is very acute. Export business is curtailed, permits being temporarily withheld. Hematite iron is scarce at 140s. Iron-ore freights are easier and tin plates are strong at 36s. Works are not eager for new business. Steel from America is much in arrears in arriving. Quotations are unchanged as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 36s.	
Cleveland pig-iron warrants, 86s. 6d.	
Steel black sheets, No. 28, export f.o.b. Liverpool, £19 15s.	
Hematite pig iron, f.o.b. Tees, about 140s.	
Sheet bars (Welsh) delivered at works in Swansea Valley, £12 10s.	
Steel bars, export, f.o.b. Clyde, £18 5s.	
Ferromanganese, £35, nominal.	
Ferrosilicon, 50 per cent, c.i.f., £29.	

The Quigley Furnace Specialties Company, Inc., 26 Cortlandt Street, New York, has been formed to manufacture and deal in materials, equipment and appliances for the improvement of furnace construction and operation, including high temperature furnace cements, insulating brick, automatic fuel oil valves, burners for oil, gas and powdered coal, temperature and draft recording and controlling systems, instruments for gas analysis, etc. The engineering and contracting department will furnish plans for installations utilizing any fuel and will prepare comparative statements of operating costs for various fuels. W. S. Quigley, who has long been connected with powdered fuel and other furnace construction, is president of the company; H. A. Kimber, vice-president, and J. H. McPadden, secretary.

Iron and Industrial Stocks

NEW YORK, May 10, 1916.

The stock market continues quite sensitive to changes in the international situation. Fluctuations of the past week have been sharp, with the varying aspects of Mexican developments as well as the interchange of notes with Germany. On the whole, however, the tendency has been upward whenever international affairs have promised a satisfactory outcome. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	24 3/4 - 27 1/2	Ry. Steel Spring, com.	37 1/2 - 44 1/2
Allis-Chal., pref.	75 1/2 - 79 1/2	Ry. Steel Spring, pref.	95 1/2 - 97 1/2
Am. Can., com.	52 1/2 - 58	Republic, com.	44 - 48
Am. Can., pref.	109	Republic, pref.	107 1/2 - 108 1/2
Am. Car & Fdy., com.	56 - 62 1/2	Sloss, com.	51 - 57
Am. Car & Fdy., pref.	116	Pipe, com.	19 1/2 - 20 1/2
Am. Loco., com.	64 1/2 - 71 1/2	Pipe, pref.	50
Am. Loco., pref.	101 1/2 - 101 1/2	U. S. Steel, com.	80 1/2 - 84 1/2
Am. Steel F'dries.	49 1/2 - 55 1/2	U. S. Steel, pref.	115 - 116 1/2
Bald. Loco., com.	83 1/2 - 90 1/2	Westing. Elec.	55 1/2 - 61 1/2
Bald. Loco., pref.	107 1/2	Am. Rad., com.	394
Beth. Steel, com.	440 - 464	Am. Ship, com.	42 - 43 1/2
Beth. Steel, pref.	135	Am. Ship, pref.	88
Case (J. I.), pref.	88	Chic. Pneu. Tool.	72 - 76 1/2
Colorado Fuel.	39 1/2 - 43	Cambria Steel.	81 - 81 1/2
Deere & Co., pref.	92 1/2 - 93 1/2	Lake Sup. Corp.	9 1/2 - 10 1/2
Gen. Electric.	162 - 166 1/2	Pa. Steel, com.	95
Gt. No. Ore Cert.	38 1/2 - 41 1/2	Pa. Steel, pref.	98 - 99
Int. Harv. of N. J., com.	110 1/2 - 112	Warwick.	10 1/2 - 10 1/2
Int. Harv. Corp., com.	70 - 70 1/2	Cruc. Steel, com.	73 - 83 1/2
Lackawanna Stl.	64 - 71 1/2	Cruc. Steel, pref.	112 - 114 1/2
Nat. En. & Stm., com.	22 1/2 - 24	Harb.-Walk. Refrac., com.	84 - 85 1/2
Nat. En. & Stm., pref.	94	Harb.-Walk. Refrac., pref.	103
N. Y. Air Brake.	125 1/4 - 136	La Belle Iron, com.	51 - 53 1/2
Pressed Stl., com.	43 - 47 1/2	La Belle Iron, pref.	128 - 128 1/2
Pressed Stl., pref.	101	Driggs-Seabury.	135 - 141
Midvale Steel.	59 - 61 1/2		

Dividends

The American Radiator Company, regular quarterly, 1 1/4 per cent on the preferred stock, payable May 15, and 4 per cent on the common stock, payable June 30.

The American Smelting & Refining Company, regular quarterly, 1 1/4 per cent on the preferred stock, payable June 1, and 1 per cent regular and 1/2 per cent extra on the common stock, payable June 15.

The Cambria Steel Company, regular quarterly, 1 1/4 per cent, payable May 15.

The Niles-Bement-Pond Company, regular quarterly, 1 1/4 per cent on the preferred stock, payable May 15, and 1 1/2 per cent on the common stock, payable June 20.

The Pratt & Whitney Company, regular quarterly, 1 1/4 per cent on the preferred stock, payable May 15.

The Studebaker Corporation, regular quarterly, 1 1/4 per cent on the preferred stock, payable June 1 and 1 1/2 per cent regular, and 1 per cent extra, on the common stock, payable June 1.

New War Record in German Pig Iron

Germany's pig-iron output for February, 1916, was 1,033,683 metric tons, against 1,078,368 tons in January. The daily rate was 35,644 tons, which is the highest since the war started. The February output was made up as follows: Foundry iron, 150,533 tons; Bessemer iron, 12,207 tons; Thomas or basic iron, 666,417 tons; steel-making iron and spiegeleisen, 184,603 tons; puddle iron, 19,923 tons. In February, 1915, the production was 803,623 tons, or 28,701 tons per day.

Shipments of the German Steel Works Union in February were 282,269 metric tons, against 285,784 tons in January. The average for last year was 270,510 tons. The February shipments were made up of 74,491 tons of semi-finished steel, 141,076 tons of railroad material and 66,702 tons of shapes.

The American Steel & Wire Company has discontinued the manufacture of shafting, which has been one of the products of its Newburgh works, Cleveland, Ohio. The company does not make hot rolled bars in large sizes for shafting, and these are now extremely hard to obtain. It will not discontinue the manufacture of screw stock, which is an important product of its Newburgh works.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast, 65c.; on plates, structural shapes, iron and steel bars, pipe and boiler tubes, tin plate, nails, spikes and wire. The foregoing rates to the Pacific coast are by rail only.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, $\frac{1}{4}$ in. thick and over, and zees 3 in. and over, 2.50c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than $\frac{1}{4}$ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	.55
No charge for cutting to lengths 3 ft. and over.	

Plates.—Tank plates, $\frac{1}{4}$ in. thick, $6\frac{1}{4}$ in. up to 100 in. wide, 2.75c. to 4c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, $\frac{1}{4}$ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered $\frac{1}{4}$ -in. plates. Plates over 72 in. wide must be ordered $\frac{1}{4}$ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of $3\frac{1}{16}$ in. take the price of $3\frac{1}{16}$ in.

Allowable overweight, whether plates are ordered to gage or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

	Cents per lb.
Gages under $\frac{1}{4}$ in. to and including $3\frac{1}{16}$ in.	.10
Gages under $3\frac{1}{16}$ in. to and including No. 8	.15
Gages under No. 8 to and including No. 9	.25
Gages under No. 9 to and including No. 10	.30
Gages under No. 10 to and including No. 12	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	.00
Cutting to lengths under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths under 1 ft.	.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Rods.—Bessemer, open-hearth and chain rods, \$60, nominally.

Wire Products.—Prices to jobbers, effective May 1: Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.45; galvanized, \$3.15. Galvanized barb wire and staples, \$3.35; painted, \$2.65. Wire nails, \$2.50. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Woven wire fencing, $61\frac{1}{2}$ per cent off list for carloads, 60% off for 1000-rod lots, 59% off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	\$2.50	\$2.55	\$2.60	\$2.65	\$2.80	\$2.90	\$3.00	\$3.10
Galvanized	3.40	3.45	3.50	3.55	3.60	3.75	4.10	4.20

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from April 21, 1916, on black and galvanized steel and iron pipe, all full weight.

Steel			Butt Weld			Iron		
Inches	Black	Galv.	Inches	Black	Galv.	Inches	Black	Galv.
$\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$	63	30 $\frac{1}{2}$	$\frac{1}{4}$ and $\frac{1}{2}$	52	19			
$\frac{1}{2}$	67	46 $\frac{1}{2}$	$\frac{1}{2}$	53	20			
$\frac{3}{4}$ to 3	70	50 $\frac{1}{2}$	$\frac{1}{2}$	57	33			
			$\frac{3}{4}$ to 1 $\frac{1}{2}$	60	38			

Lap Weld		
Inches	Black	Galv.
2	65	45 $\frac{1}{2}$
$2\frac{1}{2}$ to 6	68	48 $\frac{1}{2}$
7 to 12	65	44 $\frac{1}{2}$
13 and 14	53 $\frac{1}{2}$..
15	51	..

Reamed and Drifted		
Inches	Black	Galv.
1 to 3, butt	68	48 $\frac{1}{2}$
2, lap	63	43 $\frac{1}{2}$
$2\frac{1}{2}$ to 6, lap	66	46 $\frac{1}{2}$

Butt Weld, extra strong, plain ends		
Inches	Black	Galv.
$\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$	59	35 $\frac{1}{2}$
$\frac{1}{2}$	64	45 $\frac{1}{2}$
$\frac{3}{4}$ to 1 $\frac{1}{2}$	68	49 $\frac{1}{2}$
2 to 3	69	50 $\frac{1}{2}$

Lap Weld, extra strong, plain ends		
Inches	Black	Galv.
2	63	44 $\frac{1}{2}$
$2\frac{1}{2}$ to 4	66	47 $\frac{1}{2}$
$4\frac{1}{2}$ to 6	65	48 $\frac{1}{2}$
7 to 8	61	40 $\frac{1}{2}$
9 to 12	56	35 $\frac{1}{2}$

Butt Weld, double extra strong, plain ends		
Inches	Black	Galv.
$\frac{1}{2}$	55	38 $\frac{1}{2}$
$\frac{3}{4}$ to 1 $\frac{1}{2}$	58	41 $\frac{1}{2}$
2 to 3	60	43 $\frac{1}{2}$

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Sheets.—Makers' prices for mill shipment on sheets, of U. S. standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net, or 2 per cent cash discount in 10 days from date of invoice:

Blue Annealed Sheets		Cents per lb.
Nos. 3 to 8		2.95 to 3.20
Nos. 9 to 10		3.00 to 3.25
Nos. 11 and 12		3.05 to 3.30
Nos. 13 and 14		3.10 to 3.35
Nos. 15 and 16		3.20 to 3.45

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Box Annealed Sheets, Cold Rolled		Cents per lb.
Nos. 17 to 21		2.70 to 2.80
Nos. 22 and 24		2.75 to 2.85
Nos. 25 and 26		2.80 to 2.90
No. 27		2.85 to 2.95
No. 28		2.90 to 3.00
No. 29		2.95 to 3.05
No. 30		3.15 to 3.25

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Galvanized Sheets of Black Sheet Gage		Cents per lb.
Nos. 10 and 11		4.00 to 4.25
No. 12		4.10 to 4.35
Nos. 13 and 14		4.10 to 4.35
Nos. 15 and 16		4.20 to 4.45
Nos. 17 to 21		4.35 to 4.60
Nos. 22 and 24		4.55 to 4.80
Nos. 25 and 26		4.70 to 4.95
No. 27		4.85 to 5.10
No. 28		5.00 to 5.25
No. 29		5.15 to 5.40

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap-welded steel tubes and standard charcoal-iron tubes, effective from April 15, 1916, are as follows:

Lap Welded Steel		Standard Charcoal Iron	
1 $\frac{1}{2}$ in.	35	1 $\frac{1}{2}$ in.	27
1 $\frac{1}{2}$ and 2 in.	47	1 $\frac{1}{2}$ and 2 in.	39
2 $\frac{1}{2}$ in.	44	2 $\frac{1}{2}$ in.	36
2 $\frac{1}{2}$ and 2 $\frac{1}{2}$ in.	50	2 $\frac{1}{2}$ and 2 $\frac{1}{2}$ in.	42
3 and 3 $\frac{1}{2}$ in.	55	3 and 3 $\frac{1}{2}$ in.	47
3 $\frac{1}{2}$ to 4 $\frac{1}{2}$ in.	56	3 $\frac{1}{2}$ to 4 $\frac{1}{2}$ in.	48
5 and 6 in.	49	5 and 6 in.	41
7 to 18 in.	46	7 to 13 in.	38

Locomotive and steamship special charcoal grades bring higher prices.

1 $\frac{1}{2}$ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery								
	Copper, New York	Tin,	Lead	Spelter				
	Electro-	New	New	St.	New	St.		
May	Lake	lytic	York	York	Louis	York	Louis	
3	29.00	28.50	51.50	7.50	7.37½	17.50	17.25	
4	29.00	28.50	51.00	7.50	7.37½	17.50	17.25	
5	29.00	28.50	50.25	7.50	7.37½	17.37½	17.12½	
6	29.00	28.50	... 50.00	7.50	7.37½	17.25	17.00	
8	29.00	28.50	50.00	7.50	7.37½	17.12½	16.87½	
9	29.00	28.50	49.75	7.50	7.37½	17.00	16.75	

NEW YORK, May 10, 1916.

Copper is dull but firm. Tin is weaker with very little demand. Lead is unchanged and quiet but steady. Spelter is neglected and prices have declined. Antimony is lower with demand very slack.

New York

Copper.—A peculiar feature of present conditions in this market is that some sellers state that buyers are in need of prompt and nearby metal, while on the contrary other sellers report an inability to dispose of any whatever. Some producers report a fair domestic business having been done, while others insist there is nothing being sold. These flat contradictory reports render the market hard to judge. Very little business has been transacted outside of some sales of arsenical Lake copper in which a fair movement is reported. But in electrolytic and in all grades of Lake no business has been done and the entire market is dull and uninteresting. Rumors of large prospective foreign orders pending do not materialize and the conviction is growing that it may be only gossip. Brass rods and discs are reported easier with comparatively few inquiries for rods. Electrolytic copper for far future delivery, such as from September on, is probably obtainable at 28.75c., while prompt metal is 30.50c., New York, but nominal. Lake copper for September is quoted at 29c. to 29.50c. The London quotation for electrolytic has gone to £153 10s. as against £145 a week ago. Exports of copper to May 9 inclusive were 3396 tons.

Tin.—The market is very quiet. Last Friday a fair business was reported, but it was not large, amounting to about 200 to 250 tons. On the same day there was a big demand for futures, but since then dullness has prevailed. It is believed that consumers have fair stocks on hand, rendering it unnecessary to buy either spot or future material. The arrivals amount to 1020 tons, with 4000 tons afloat. Spot tin a week ago was as high as 51.50c., but yesterday it had declined to 49.75c., with no demand.

Lead.—There has been no change since last week, the market continuing dull and only drifting. It needs new life. Sellers are apparently restless, but not ready to cut prices. The metal is still obtainable at 7.50c., New York, and 7.37½c., St. Louis. Weakness is reported at St. Louis, a sale of 100 tons there at 7.32½c. being reported last week. But buyers deem it unwise to bid 7.25c., St. Louis, unless prepared to absorb it. Resale metal is also understood to be available from some consumers well stocked. There is no buying. Exports to May 10 were 397 tons.

Spelter.—This market is also dull and weak. A lack of demand from the brass producers is in evidence as well as only fitful buying by the galvanizers. The metal is lower for early delivery, being obtainable at 17c., New York, and 16.75c., St. Louis. May spelter is quoted at 17.50c. to 17c., New York, with June at 16.25c., July at about 15.75c., and last quarter at about 13c. to 13.50c. A little better inquiry was reported yesterday, but not much interest in general is detected. Spelter exports to May 10 amounted to 1937 tons.

Antimony.—Large arrivals and no demand have caused the price to decline and rendered the market dull. Spot Chinese and Japanese grades can now be obtained at 35c., duty paid.

Aluminum.—The market is still 58c. to 60c. for

No. 1 virgin aluminum, 98 to 99 per cent pure. Heavy Russian buying is reported, however.

Old Metals.—The market is firm on copper and brass scrap, with a good inquiry. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible	27.00 to 28.00
Copper, heavy and wire	26.00 to 27.00
Copper, light and bottoms	23.00 to 24.00
Brass, heavy	16.00 to 16.50
Brass, light	13.50 to 14.00
Heavy machine composition	20.00 to 21.00
No. 1 yellow rod brass turnings	16.00 to 16.50
No. 1 red brass or composition turnings	17.00 to 18.00
Lead, heavy	6.50
Lead, tea	6.00
Zinc	13.00 to 14.00

Chicago

MAY 8.—While the copper market has held steadily, with a good volume of buying, slight recessions were the rule in the prices of other metals. We quote: Casting copper, 28c. to 28.50c.; Lake copper, 30c. to 30.25c.; tin, carloads, 51c., and small lots, 53c.; lead, 7.35c.; spelter, 17c.; sheet zinc, 25.50c.; Cookson's antimony, 50c.; other grades, 38c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 23.50c.; copper bottoms, 21.50c.; copper clips, 22c.; red brass, 18.50c.; yellow brass, 14c.; lead pipe, 6.25c.; zinc, 13c.; pewter, No. 1, 30c.; tinfoil, 35c.; block tin pipe, 40c.

St. Louis

MAY 8.—Non-ferrous metals have, for the most part, been rather easy during the week, closing to-day as follows: Lead, 7.65c.; spelter, 19.50c.; tin, 54c.; lake copper, 31c.; electrolytic copper, 30.50c.; antimony, 42c. In the Joplin ore district zinc blende continued firm, with the basis range from \$85 to \$115 per ton, with one sale reported at \$116. The average for the week of all grades was \$97. Calamine was in fair demand at \$70 to \$80, with the average for the week \$71. Lead ore was weaker and ranged from \$96 to \$97, with the average for the week \$96. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 10c.; heavy yellow brass, 13.50c.; heavy red brass and light copper, 15.50c.; heavy copper and copper wire, 19c.; lead, 5.50c.; tea lead, 3.50c.; zinc, 10c.; pewter, 24c.; tinfoil, 35c.

Important Addition to a Buffalo Color Plant

The Schoellkopf Aniline & Chemical Works, Inc., Buffalo, N. Y., has purchased several acres adjoining its present plant, already one of the largest color-making factories in the United States, and let the general contract to the John W. Cowper Company, Buffalo, for the erection of seven large buildings. The new construction will comprise five manufacturing buildings, a power plant and storage warehouse. There will be two acid manufacturing buildings, each 100 x 250 ft., three stories and basement, of brick and steel; three color buildings, each 100 x 168 ft., three stories and basement, brick and steel; warehouse, 76 x 400 ft., four stories and basement, reinforced concrete; power house, 200 x 250 ft., including boiler plant and refrigerating plant, equipped with engines, turbines, etc., to develop 3000 hp. The total amount of the contract placed with the Cowper Company is about \$1,000,000. This great expansion of color-making facilities is brought about by the heavy demand for commercial dyes and color.

Another Month of Enormous Foreign Trade

The Department of Commerce, through the Bureau of Foreign and Domestic Commerce, reports a record-breaking movement of merchandise for the month of March. The exports of merchandise in that month reached a total volume of \$409,850,425, while similar imports were valued at \$213,589,785. Both sides of the trade movement were considerably in excess of anything previously attained. The total of exports and imports of course constituted a new record in our foreign trade. The excess of exports over imports in the month of March was not so great as in some previous months, but it was nevertheless very heavy, amounting

to \$186,260,640. The excess of exports for the nine months ended March 31, 1916, was \$1,491,260,514, against \$717,464,226 in the corresponding period of 1915, or more than double.

Expansion of Buffalo Wire Works

The Buffalo Wire Works Company (formerly Scheeler's Sons), 316-326 Terrace, Buffalo, N. Y., is moving its entire wire work department to Nos. 290-294 Terrace, corner of Genesee Street, in the building formerly occupied by the Buffalo Meter Company. It is a brick building, 67 x 70 ft., five stories, and gives an additional floor space of 25,000 sq. ft. The machinery for manufacturing wire work of all descriptions, such as window guards, desk and counter railings, elevator cabs, tool room inclosures, fencing, wire signs, ornamental panels, grilles, wickets, folding gates, lockers, etc., will be removed to this new plant, practically doubling the company's capacity to manufacture these articles. The removal of the department from its old quarters enables the weaving department to be increased. These enlargements have been necessitated by the constantly growing demand for Buffalo wire products. Since opening the Philadelphia branch, at 11 South Seventh Street, last fall, the company has been compelled to increase its quarters there also, taking on three additional floors at No. 9, giving an additional 10,000 sq. ft. of floor space on which to carry a still larger stock of Buffalo wire products.

Heavy Lake Ore Shipments in April

Iron-ore shipments from the Lake Superior region in April were on an unusual scale, as shown by the following table, which is in gross tons:

	April,	April,
	1915	1916
Escanaba	49,307	398,214
Marquette	4,438	53,258
Ashland	43,949	147,852
Superior	87,175	211,340
Duluth	174,989	538,281
Two Harbors	143,974	309,466
Total	503,832	1,658,411
Increase		1,154,579

The increase of 1,154,579 tons is 229.16 per cent, which augurs well for a record-breaking tonnage in 1916. While the Duluth and Superior percentage of the total is about the same as last year, the Escanaba contribution is much larger, due to the breaking of the ice at that port last month, being 24 per cent in April this year against only 9.8 per cent last year.

A Lake Erie Ore Dock to Be Enlarged

It is announced that the Pittsburgh & Conneaut Dock Company, a subsidiary of the United States Steel Corporation, will build a new dock at Conneaut, Ohio, 2050 ft. long and 1015 ft. wide, on the site of the present one. The dock will be of concrete and steel construction and it is planned to equip it with eight ore unloading machines and two 700-ft. conveyor bridges. It will have a storage capacity of 8,800,000 tons of ore and will provide space for four ships at one time. The Bessemer & Lake Erie Railroad, another subsidiary of the Steel Corporation, is building a four track railroad system from the present dock to a point two miles from the city and is enlarging its ore storage yards. It is stated that the construction of the dock will begin about June 1.

The Stove Founders' National Defense Association, which held its annual meeting on Tuesday, May 9, at the Hotel Astor, New York, re-elected officers as follows: George Mitchell, Pittston, Pa., president; Lewis Moore, Joliet, Ill., first vice-president; Joseph L. Anthony, Taunton, Mass., second vice-president; William A. Dwyer, Detroit, Mich., treasurer; Robert W. Sloan, Pittston, Pa., secretary. A testimonial of \$4,000 was given to President Mitchell for the able manner in which he has conducted the affairs of the association.

The Roane Iron Company has been repairing its No. 2 furnace at Rockwood, Tenn., and expects to blow it in next week.

Again the Steel Corporation's Largest Order Book

Again the largest unfilled tonnage at the close of any previous month in the history of the U. S. Steel Corporation was shown by the monthly report revealing a tonnage of 9,829,551 tons on the books April 30, 1916. This is an increase of 498,550 tons over the unfilled orders at the close of March, 9,331,001 tons, which was the second consecutive record month. The following table shows the unfilled tonnage for each month, beginning Dec. 31, 1912:

April 30, 1916	9,829,551	July 31, 1914	4,158,589
March 31, 1916	9,331,001	June 30, 1914	4,032,857
Feb. 29, 1916	8,568,966	May 31, 1914	3,998,160
Jan. 31, 1916	7,322,767	April 30, 1914	4,277,068
Dec. 31, 1915	7,806,220	March 31, 1914	4,653,825
Nov. 30, 1915	7,189,489	Feb. 28, 1914	5,026,440
Oct. 31, 1915	6,165,452	Jan. 31, 1914	4,613,680
Sept. 30, 1915	5,317,618	Dec. 31, 1913	4,282,108
Aug. 31, 1915	4,908,455	Nov. 30, 1913	4,396,347
July 31, 1915	4,928,500	Oct. 31, 1913	4,513,767
June 30, 1915	4,678,196	Sept. 30, 1913	5,003,785
May 31, 1915	4,264,598	Aug. 31, 1913	5,223,468
April 30, 1915	4,162,244	July 31, 1913	5,399,356
March 31, 1915	4,255,749	June 30, 1913	5,807,317
Feb. 28, 1915	4,345,374	May 31, 1913	6,324,322
Jan. 31, 1915	4,248,571	April 30, 1913	6,978,762
Dec. 31, 1914	3,836,643	March 31, 1913	7,468,956
Nov. 30, 1914	3,324,592	Feb. 28, 1913	7,656,714
Oct. 31, 1914	3,461,097	Jan. 31, 1913	7,827,368
Sept. 30, 1914	3,787,667	Dec. 31, 1912	7,932,164
Aug. 31, 1914	4,213,331		

New Georgia Shipbuilding Plant

The Brunswick Marine Construction Company has been incorporated for the purpose of establishing a shipbuilding plant at Brunswick, Ga. The principals in the company are George W. Hinckley, secretary and treasurer of the Apex Equipment Company, New York City; W. U. Taylor, New York City, a lawyer who has long been identified with marine interests; L. J. Nilson, Baltimore, an experienced Swedish shipbuilder, son of a shipbuilder now operating a plant in Sweden; Albert Fendig and C. G. Huggins, of Brunswick. E. L. Huggins, New York City, an experienced naval architect, will assist Mr. Nilson in operating the plant. The company will at first build wooden vessels, but it is the intention ultimately to equip for building steel steamships of all kinds. Operations will start with the construction of four 2000-ton sailing vessels of the five-mast type, each equipped with engines of 750 hp. for auxiliary use. These vessels are to be rushed to completion, so as to be put in service while the demand for bottoms is so great and ocean freight rates are so remunerative.

Railroad Car Buying

The Pressed Steel Car Company has now closed for 1000 cars for the Paris-Lyons-Mediterranean Railroad, 500 more being placed in the last week. The Chicago & Northwestern has placed 1000 wood box cars with the American Car & Foundry Company, this representing a change from original design to minimize the amount of steel. The Anaconda Copper Mining Company has bought 200 hopper cars from the Western Car & Foundry Company and 88 anode cars from the Mount Vernon Car Mfg. Company.

The more active inquiries include 100 to 300 automobile cars for the San Pedro, Los Angeles & Salt Lake and 65 storage battery cars for the New York Railway Company. The Norfolk Southern is to build 250 freight cars in its own shops, and the Seaboard is in the market for 50 caboose cars and 15 express cars.

New Mill Records at South Chicago

The pace at which the steel mills are operating is resulting in a succession of new production records. No. 2 open-hearth department at South works, Illinois Steel Company, with fourteen 50-ton furnaces, made 75,140 tons of steel in March, which is within 2000 tons of the best previous record of a like number of 100-ton furnaces. At the finishing mills new records were made as follows: No. 1 blooming mill, 51,314 tons, as compared with the previous record of 49,858 tons; No. 1 structural mill, 39,529 tons against 31,978 tons; No. 2 blooming mill, 24,891 tons, as against 22,759 tons, and No. 2 structural mill, 19,178 tons, as against 16,141 tons.

STRIKES AND WAGE ADVANCES

Pittsburgh Troubles Diminishing

The strike of employees of the Westinghouse Electric & Mfg. Company at East Pittsburgh practically ended on Tuesday, May 9, when there was a rush of strikers to enter the plants as soon as the gates were opened. President E. M. Herr told the strikers' committee on Monday that unless all employees were in their places the next morning they would lose the benefits accruing under the company's compensation and pension system. The strike, which was called April 22, was to enforce an 8-hr. day, and, according to the company, cost the workmen \$1,397,500 in wages. Work also was resumed at the plants of the Westinghouse Air Brake Company, Pittsburgh Meter Company, Westinghouse Machine Company, and Union Switch & Signal Company and R. D. Nuttall Company. No concessions have been made to the men in any of the Westinghouse plants.

The strike at the Woods Run and McKees Rocks works of the Pressed Steel Car Company in Pittsburgh has not ended, but the number of men at work at each plant is steadily growing larger. J. B. Rider, the general manager of both plants, states that he has been unable to find out just what the men want, as they do not seem to be a unit, each committee visiting him having different demands to make. The advances asked range all the way from 10 to 50 per cent for the same kind of work. The company states it is paying the highest wage rates it can possibly pay under present conditions, and the granting of an 8-hr. day to its machinists is absolutely impossible.

The employees in the works of the Aluminum Company of America at New Kensington, Pa., are still striking, the men demanding an 8-hr. day with the same rate of pay as for 10 hrs. Only a small part of the employees are at work, and the trouble may not be settled for some time.

The labor trouble at the plant of the West Penn Steel Company, Brackenridge, Pa., was ended May 4, the company having rearranged its wage scales, effective from May 1. Employees were given advances ranging from 10 to 15 per cent.

The plate mill of the Cambria Steel Company at its Franklin works, Johnstown, Pa., was closed last week, the men demanding a large advance in wages, which the company refused to grant.

Effective Monday, May 8, the H. C. Frick Coke Company, subsidiary of the United States Steel Corporation, advanced the wages of its miners and coke workers an average of nearly 5 per cent, following a previous advance made by this company which went into effect Feb. 1. This advance in wages affects about 18,000 men employed by that company alone.

Daily press reports printed in regard to labor troubles in the Beaver Valley have been exaggerated. Manufacturing concerns in New Brighton and Beaver Falls have been affected very little so far, and reports that the plant of the Union Drawn Steel Company had closed down entirely on account of a strike are incorrect. A few of its machinists are out on strike, but the operations of the plant have not been seriously affected.

About 200 machinists employed in shops at Bradford, Pa., went on strike last week, employers refusing their demand of an 8-hr. day and a wage increase of from 37½ cents to 50 cents per hour and closed shops. Operators say they cannot possibly grant this demand, and that they will discontinue machine work unless the men withdraw it.

Machinists employed by the Turner-Fricke Company, Sharon, Pa., builder of gas engines, have gone on a strike for an 8-hr. day and 50c. per hr. The plant is closed, pending a settlement of the trouble.

Ohio Labor Notes

The backbone of the Cincinnati machinists' strike has been broken. A canvas of plants affected shows that nearly 500 strikers have returned, and a further gain has been made for the employers of 150 new men up to May 8. As far as can be ascertained, not a

single additional man joined the strikers' ranks on Monday of this week.

The machinists on strike in the various machine shops in Youngstown have not yet returned to work, the employers absolutely refusing the demands of the men for a minimum wage rate of 50c. per hour for an 8-hr. day. The Business Men's Association, recently organized at Youngstown, is handling strike matters, and has printed advertisements and issued statements that an 8-hr. day in the Youngstown machine shops is impossible under present conditions, and will not be granted.

Employees of the Youngstown Sheet & Tube Company, Youngstown, on Saturday, May 6, sent a letter to the company demanding an 8-hr. day, "without reduction of pay, regardless of the numbers of hours now constituting a day's work, to all engineers, oilers, firemen, millwrights, electrical workers, machinists, boilermakers, sheet-metal workers, pipe fitters, blacksmiths, galvanizers, handymen, helpers and laborers," the demand to become effective on or before May 13, 1916. No official answer has been made to this letter, but it is stated that the demands of the men will be firmly refused.

The Standard Steel Tube Company, Toledo, has voluntarily granted its 400 employees an increase in wages and an 8-hr. day, with 45 hr. a week in summer. The lowest paid men, who have been receiving \$2.25 for 9 hr., will be paid \$2.40 for an 8-hr. day, and men getting 45c. per hour have been advanced to 50c.

The Republic Enameling & Stamping Company, Canton, has granted its employees an average advance of 10 per cent, effective from May 1. The advance was entirely voluntary on the part of the company, and is said to affect over 1000 men.

Under the terms of the 10 per cent recent wage advance announced by the leading steel companies in the Youngstown district, the rate of common labor was fixed at \$2.42 per day of 10 hr. However, on April 26 this rate was raised to 25c. per hour, or \$2.50 per day of 10 hr. This rate for common labor is standard with all the steel mills in the district.

Other Localities

The International Harvester Company has given between 2000 and 2500 employees at its Milwaukee works a reduction from 55 to 50 hr. a week at the former pay. Other employers are taking care of wage increases as the individual merits of the case makes advisable, but it is the expected organized demand for an 8-hr. day which is the most disquieting feature of the situation in Milwaukee.

New England reports show but little change in the strike conditions in the few plants now affected. There is evidence, however, that the labor unions are mustering their forces for a great drive against the employers' organizations which, in most industrial centers, are aggressively working against the closed-shop movement, the shorter working day and the undue inflation of wages.

The employees of the Ingersoll-Rand Company's plants at Phillipsburg, N. J., and Easton, Pa., were surprised on Saturday, May 6, when the company posted signs at each plant stating that it would give a voluntary wage increase of 10 per cent. The raise took effect May 1.

The workmen of the Lalance & Grosjean Mfg. Company, Woodhaven, Long Island, are on strike for higher wages and shorter hours. An effort to introduce other workmen to break the strike led to a riot on Monday, May 8, but without serious injuries to any participants. A general increase of 10 per cent was given to the company's employees at Harrisburg, Pa., effective May 8.

In its report for April the free employment bureau of Louisville, Ky., comments on the scarcity of skilled labor, saying that many applications cannot be filled. Demands for skilled labor in the metal trade have been in excess of the supply for six months, it is stated. In some cases, it is set forth, scouts for manufacturers are going so far as to enlist watch-makers to enter their factories as machinists.

Pittsburgh and Nearby Districts

The fourteenth annual dinner of the Traffic Club of Pittsburgh was held in the William Penn Hotel on the evening of May 3. It was attended by prominent railroad officials from all parts of the country and by leading iron and steel manufacturers. J. Fred Townsend, traffic manager of the National Tube Company, Pittsburgh, who is president of the club, acted as toastmaster. J. F. Holsworth, dean of the School of Economics, University of Pittsburgh, made an address on "Economic Preparedness." A. B. Ewer, traffic manager of the Harbison-Walker Refractories Company, Pittsburgh, had charge of the dinner, which was one of the most successful ever given by the club.

Rapid work is being done on the new blast furnace now being erected by the Cambria Steel Company at Johnstown, Pa. The new stack will have a daily capacity of 550 to 600 tons, and will give the company a total of nine furnaces.

A permanent organization for the welfare and safety of employees of the H. C. Frick Coke Company was formed at a meeting of 54 representatives of the various plants held April 27, in Connellsville, Pa. No name for the new organization has been selected. The purpose is to promote welfare and safety instruction among employees and to afford better incentives to social activities. John E. Struble is president; Patrick Kane, vice-president; Robert Morton, secretary, and Lyell Buttermore, treasurer.

The Cherry Tree Machine Company, Cherry Tree, Pa., with a capital stock of \$25,000, has been incorporated by J. C. Cosgrove, H. V. Brown and C. T. Paul, all of Johnstown, Pa., to operate a foundry and machine shop, construct mine cars, etc.

The Modern Tool Company, Erie, Pa., has opened a district office at 50 Church Street, New York City. Paul B. Oatman will have charge of sales of small tools, and Walter H. Foster of sales of grinding machines. I. D. Parker has been appointed purchasing agent of the company, with headquarters in the main offices in Erie, Pa.

The Youngstown Chemical Company, Youngstown, Ohio, with a capital stock of \$50,000, has been organized and, it is stated, will build a plant for the manufacture of chemicals from by-products.

The By-Product Coal Company, Huntington, W. Va., has been organized to develop 3000 acres of coal lands in Pike County, Ky. Z. T. Vinson, Donald Clark, and others, are the incorporators.

The Highland Iron Company, Pittsburgh, with a capital stock of \$10,000, has been incorporated by Russell J. Esler, Tarentum, Pa.; Stephen Stone, 464 Frick Building, Pittsburgh, and C. M. McKinney, Pittsburgh.

The Weber Sign Company, Pittsburgh, with a capital stock of \$5,000, has been incorporated by Harry L. Weber, 1604 Centre Avenue, Pittsburgh, and others, to manufacture metal and other advertising signs.

The Aluminum Company of South America, Pittsburgh, with a capital stock of \$25,000, has been incorporated by Alexander Black, 5541 Avondale Street, Pittsburgh, treasurer, and Allen T. C. Gordon, Miles H. England, and others, to manufacture aluminum products.

The Brier Hill Steel Company, Youngstown, Ohio, started up its new No. 9 furnace in its open-hearth plant last week and No. 10 furnace will be started about May 15. These furnaces will increase the company's output of steel from 10,000 to 12,000 tons per month.

The H. C. Frick Coke Company is offering its employees the opportunity of spending 30 days in the Military Instruction Camp, maintained by the United States Army at Plattsburg, N. Y., without loss of pay during absence from work. While this offer will be limited to a reasonable number, as the regulations of the camp prescribe and its accommodations will allow, it is open to all employees who possess the required qualifications. These include a high school education, or its equivalent, and physical fitness to undergo regular camp duty and routine. Applications must measure

up to an accepted standard of moral character and must therefore come under the general qualifications of good citizens.

It is unofficially stated that the earnings of the Crucible Steel Company of America in April were slightly over \$2,000,000 net. This will make the total net earnings in the four months ended April 30 about \$7,750,000.

The Carbon Steel Company, Pittsburgh, has received an order from Italy for 30,000 tons of steel rounds for the manufacture of shells. Billets made to special analysis by Corrigan, McKinney & Co., Cleveland, Ohio, will be rolled in the two plants of the Carbon Steel Company. It has recently bought over three acres adjacent to its present works in Pittsburgh, part of which it has occupied for some time under lease, and this ground will be used some time in the future for making large extensions, the exact nature of which has not yet been determined.

Arsenal Machinists Make New Demands

WASHINGTON, D. C., May 9, 1916.—An attempt to force the War Department to make a substantial increase in the wages paid at the Rock Island, Ill., arsenal to machinists, tool makers and turret lathe operators under a threat of action designed to embarrass the Government has recently been made, but is being resisted by the Secretary of War on the ground that the department has yet had no information that would justify it in granting any further advance than that recently made. On May 1 the machinists employed at the arsenal forwarded by telegraph to the Secretary of War, through their district president, a demand for 25 cents a day increase for every machinist, tool maker and turret lathe operator at the arsenal, without discrimination, and threatened "drastic action" if it be not complied with by May 15. Some time ago the Department of Labor, at the request of the Secretary of War, investigated the wages paid machinists in the three cities in the immediate vicinity of Rock Island. It found that wages had risen in these cities, and over a month ago, in consequence of the investigation, the wages of some 94 machinists, tool makers and turret lathe operators at the arsenal were increased. As though all this had not been done, which they well knew, the machinists in their telegram demanded that the "findings of the investigation of the Department of Labor be put into effect."

Secretary Baker has asked the Department of Labor to inform him whether in the three cities close to the Rock Island arsenal there are establishments with work comparable with that of the arsenal. On this point no answer has yet been given. In advance of its receipt, the Secretary of War says he sees no warrant for directing a further increase of wages at the arsenal, which already exhibit "the Government's usual and proper liberality in conforming to the scale of the vicinity, without deduction in consideration of the eight-hour day or of the full pay given for some 28 days in the year without work, comprised in the 15 days' annual leave, the 7 national holidays, and the Saturday afternoons during the summer months."

W. L. C.

Trumbull Steel Company's Improvements

The Trumbull Company expects to have its plant extension completed in July, largely increasing its present sheet-making capacity. Eight new hot mills are being installed, two of which are for rolling blue annealed sheets in wide sizes. The company has just begun the erection of a new office building.

It will shortly begin to erect a plant for the manufacture of cold rolled strip steel, which will have a capacity of about 1000 tons per month. Contracts for the equipment have been placed. The plant will occupy a steel building, 100 x 200 ft., which will be erected by the McClintic-Marshall Company. Samuel McCormack, who has been identified with the cold rolled strip steel industry in the Pittsburgh district, has become associated with the company as general manager of the cold rolled strip steel department.

PERSONAL

M. Alan Hill, formerly assistant superintendent of the open-hearth department of the National Tube Company, Lorain, Ohio, has resigned to become superintendent of the open-hearth plant of the Colorado Fuel & Iron Company, Pueblo, Col. He was formerly connected with the South Sharon works of the Carnegie Steel Company, leaving there in December, 1908, to go to Lorain.

J. J. Dillon has been appointed superintendent of the pipe mill of the National Tube Company at Lorain, Ohio, succeeding Charles Fell, recently appointed manager of the entire plant. Mr. Dillon has been night superintendent and has been connected with the Lorain plant for nine years.

Harry D. Bush, general superintendent of the Carnegie Steel Company in Baltimore, Md., has been elected president of the Baltimore Association of the American Society of Civil Engineers. He is also one of the directors named to prepare an inventory of Maryland's industries for the Government in connection with industrial preparedness.

C. J. Bansbach, formerly with Marshall & Huschart Machinery Company, Chicago, is now vice-president of the Pierce Machine Tool Company, manufacturer of turret machinery, at 617 West Jackson Boulevard, Chicago.

William A. Parent has resigned his position as general manager of the Edw. Darby & Sons Company, after thirty-four years of service, and is now general manager of the Dexter Metal Mfg. Company, successor to Merritt & Co., Camden, N. J., whose specialties are steel lockers, steel shelving, wire guards and ornamental brass and iron work.

Charles A. Ford, superintendent of the transportation department of the Steelton plant of the Pennsylvania Steel Company, resigned May 8, having accepted a position in the operating department of the Chicago, Rock Island & Pacific Railroad at Chicago. He is succeeded by J. H. MacDonald, of the traffic department of the Pennsylvania Railroad at Philadelphia.

I. B. Wade has been appointed auditor of the Midvale Steel Company, Philadelphia, succeeding G. Aertsen, who was made assistant to the vice-president. The appointment became effective May 1. Mr. Wade's duties will comprise complete charge of the manufacturing costs and general accounting of the company. For the present he will be located at the Midvale works, Nicetown.

Daniel Bontecou, assistant superintendent of blast furnaces at South works, Illinois Steel Company, has resigned to take charge of the furnace of the St. Louis Furnace Company, St. Louis, Mo.

Alex Paterson, treasurer, Seneca Iron & Steel Company, Buffalo, N. Y., has returned from a three months' sojourn in California.

Wm. S. Kies, vice-president of the National City Bank, New York, has been elected a vice-president of the American International Corporation.

A. J. Moxham has resigned as president of the Aetna Explosives Company, and has been made chairman of the board. H. S. Kimball, president of the American Zinc, Lead & Smelting Company, has been elected president.

H. L. Breckenridge has been appointed purchasing agent of the Lima Locomotive Corporation, Lima, Ohio. He has been in the locomotive business, in different departments, for the past 19 years, starting in Dunkirk, N. Y., with the old Brooks plant. For the last three years he has acted as purchasing agent at the American Locomotive Company's branch in Montreal.

John Younger, chief engineer of the truck department of the Pierce-Arrow Motor Car Company, Buffalo, has been re-elected president of the Engineering Society of Buffalo, at the society's final meeting of the season held May 3 at the Hotel Statler, Buffalo. The other officers re-elec'ted are William A. James, chief engineer,

Lackawanna Steel Company, Buffalo, and Jesse G. Melendy, superintendent of the General Chemical Company, Buffalo, both as vice-presidents; William Dollar of the Bierbaum-Dollar, Inc., Buffalo, treasurer, and W. J. Gamble, Jr., Vulcan Steam Forging Company, 247 Rano Street, Buffalo, secretary. The club now has a membership of 450.

Fred. Zimmerman has been appointed superintendent of the Etna plant of the Marting Iron & Steel Company, Ironton, Ohio, succeeding W. A. Havens, who resigned to accept a position in the Pittsburgh district.

Harry D. Moore, formerly connected with the Urbana Tool & Die Company, Urbana, Ohio, has been appointed superintendent of the Moore-Eastwood Mfg. Company, Dayton, Ohio, a newly incorporated company.

W. A. Folger, manager of the Pacific Tool & Supply Company, San Francisco, is visiting Eastern machine-tool manufacturers.

Herbert C. Keith, consulting engineer making a specialty of the design and construction of bridge and structural work, has moved his offices to 154 Nassau Street, New York City.

Branch of Metal Trades Association Established in Syracuse

A branch of the National Metal Trades Association has been established at Syracuse, N. Y. George De A. Babcock, production manager of the H. H. Franklin Mfg. Company, Syracuse, is president; Huntington B. Crouse, Crouse-Hinds Electric Company, is vice-president and Jonas L. Oberdorfer, M. L. Oberdorfer Brass Company, is treasurer. The organization meeting was held at the Onondaga Hotel on May 4 and Paul B. Kendig, Seneca Falls Mfg. Company, Seneca Falls, N. Y., a member of the administrative council of the national association, officiated. At the organization meeting the following Syracuse manufacturers became members:

Brown-Lipe Gear Company, Brown-Lipe-Chapin Company, H. H. Franklin Mfg. Company, O. M. Edwards Company, New Process Gear Corporation, Straight Line Engine Company, C. E. Lipe, Engelburg Huller Company, Direct Separator Company, Crouse-Hinds Electric Company, M. L. Oberdorfer Brass Company, Kane & Roach, C. C. Bradley & Son, Inc., Dyneto Electric Company, Continental Can Company, Lefever Arms Company, Pneumelectric Machine Company, Porter-Cable Machine Company, Llewellyn & Doyle and Milliner & Edlund.

Midvale's Branch Sales Managers

The following have been appointed district managers of sales for the Midvale Steel Company, the Cambria Steel Company and the Worth Brothers Company, the three companies controlled by the Midvale Steel & Ordnance Company:

- L. B. Morris, 165 Broadway, New York.
- H. W. Hayes, 40 Court Street, Boston.
- J. E. McLain, Oliver Building, Pittsburgh.
- Edson H. Harris, Widener Building, Philadelphia.
- R. E. Dexter, Penobscot Building, Detroit.
- H. P. Hubbell, Chemical Building, St. Louis.
- J. L. Adams, Union Trust Building, Cincinnati.
- W. B. Smyth, Swetland Building, Cleveland.
- W. K. Stone, Candler Building, Atlanta.
- Clifford J. Ellis, McCormick Building, Chicago.

All except Messrs. Harris and Dexter were formerly identified with the Cambria Steel Company.

Dinner of Providence Engineers

A large number of Rhode Island engineers attended the first annual dinner of the newly-organized Providence Engineering Society at the Hotel Narragansett, Providence, May 3. Frank B. Gilbreth was toastmaster. Among the speakers were W. H. P. Faunce, president Brown University; Calvin W. Rice, secretary American Society of Mechanical Engineers; Prof. Charles F. Scott, Sheffield Scientific School, Yale University, representing the American Institute of Elec-

trical Engineers; Prof. Hardy Cross, Brown University, representing the American Society of Civil Engineers; and Henry A. Wise Wood, president American Society of Aeronautic Engineers, who delivered a forceful and interesting talk on "The Wisdom and Ethics of Preparedness." The membership of the new organization is growing rapidly and it is expected to be a power in its State and nearby sections of Connecticut and Massachusetts.

Dinner to Employees of Stamford Rolling Mills

The Stamford Rolling Mills Company on the evening of May 4 gave a dinner to its employees at the Davenport Hotel, Stamford, Conn. It was called a get-acquainted dinner. The company less than a year ago took over the United German Silver Company, at Springdale, at that time employing about 30 men. The capacity of the plant has since been increased many times. In addition it has taken over the American Cupro-Nickel Company, on Fairfield Avenue, so that at the present time, in output and capital, it compares favorably with the large brass rolling mills of the United States. It is the policy of the company to look after its employees and increase friendliness and co-operation.

Those present included Harry Wright, vice-president and general manager; W. F. Blake and M. K. Weill, mill managers; R. A. Wood and Mr. Wilkie, general superintendents; Mr. Peters, foundry superintendent; Mr. Blades, auditor; E. C. Evans, mechanical engineer; Mr. Wiley, general superintendent of stores; C. H. Hart and J. A. Sommerville, storekeepers; Paul Head, purchasing agent; Mr. Cuenin, traffic manager; George D. Wright, sales manager; A. P. Meng, chemist, and a large number of the workmen. Harry Wright, who presided, made an inspiring address. Other officials followed with expressions of loyalty to the company's interests.

Investigating the Spanish Steel Trade

A Spanish royal decree of March 16, 1916, appoints a commission to study the iron and steel situation in Spain and to suggest means to alleviate existing conditions. Fifteen days are given in which to report on the best means of fixing prices and regulating, restricting, taxing or prohibiting export. Objections have been made to the export tax on iron and steel under the royal order of Jan. 1, 1916, the claim being that there is a surplus of metal produced which can only be advantageously disposed of abroad. On the other hand numerous interests have urged the restriction or prohibition of the export to keep raw material prices down. Sheet iron and steel are protected in Spain by a customs tariff of about 70 per cent of the value, and machinery and apparatus made of such material pay a duty averaging about 15 per cent. Sheets before the war brought \$45 per ton in Spain and since have risen to \$77, which is stated to be greatly in excess of prices in belligerent countries.

Occupational disease prevention and development of first aid in industrial establishments will be the theme of the second industrial hygiene conference to be held at Harrisburg, Pa., May 18, under the auspices of the Pennsylvania Department of Labor and Industry. Dr. Francis D. Patterson, chief of the industrial hygiene division, will be in charge. Among the speakers will be Dr. J. W. Luther, New Jersey Zinc Company; Dr. W. O'Neil Sherman, Carnegie Steel Company; Dr. Randolph Zimmerman, Westinghouse Airbrake Company; Dr. John B. Bowman, Cambria Steel Company; Dr. Charles A. Lauffer, Westinghouse Electric & Mfg. Company.

The Ohio Corrugating Company, Warren, Ohio, will shortly add to its present products the manufacture of steel drums in all sizes. It is installing barrel-making equipment furnished by the Niagara Machine & Tool Works, Buffalo, N. Y., to provide a daily capacity of 500 drums. It has also just begun the manufacture of sheet metal ceilings.

The Largest Locomotive Frames

The largest locomotive engine frames ever made were recently poured by the Chester, Pa., plant of the American Steel Foundries. They were of vanadium cast steel and had a shipping weight of about 16,750 lb. The length over all was 45 ft. 4 in. Over 22,000 lb. of steel was necessary to pour each frame. Analyses averaged 0.28 per cent carbon, 0.67 per cent manganese and 0.181 per cent vanadium. After annealing by the method of slow cooling in a closed annealer, coal-fired, the static and dynamic properties shown by test bars attached to the frames were as follows:

Static and Dynamic Tests of Vanadium Cast Steel Locomotive Frames

Tensile Strength, Lb. Per Sq. In.	Elastic Limit, Lb. Per Sq. In.	Elongation in 2 In.	Reduction of Area, Per Cent	Elastic Rated, Per Cent	Dynamic Alternating Impacts, Per Cent
86,500	45,500	24.0	38.8	56.5	2,418
75,000	44,000	28.0	41.3	58.6	2,751
80,500	50,000	23.0	37.2	62.1	—
79,500	50,000	23.0	38.2	62.9	1,544
81,500	49,500	23.0	37.6	60.7	1,828
85,500	47,000	24.0	39.4	54.9	2,592
83,000	51,500	25.0	38.8	62.0	2,996
78,000	55,000	24.0	40.3	70.5	3,126
75,000	44,000	24.0	37.2	58.6	2,410
80,500	53,000	25.0	40.7	65.3	2,560
82,000	49,000	24.0	39.7	60.0	2,572
76,000	46,500	25.0	40.0	61.1	3,594
78,000	45,000	24.0	38.8	57.7	3,106

Bending tests on a bar 1 by $\frac{1}{2}$ in. were all 180 deg. except one which was 170 deg.

The average elastic ratio is 60.8 per cent, which is equal to previous published tests of this grade of steel.

These frames were for locomotives of the Santa Fé type built for the Atchison, Topeka & Santa Fé railroad by the American Locomotive Company. The largest previously recorded frames were poured by the Union Steel Casting Company of Pittsburgh, as mentioned in THE IRON AGE, Dec. 9, 1915. They were 41 ft. 7 in. long and weighed 13,250 lb. each.

Special South American Agent Desired

The Department of Commerce announces that the examination for special agent to investigate South American markets for construction materials and machinery for men only, will be held in the various cities of the country, May 19. The salary will not exceed \$10 a day for every day in the year. Actual transportation expenses and actual subsistence expenses, not to exceed \$5 per diem, will also be paid. The examination will consist of:

1. Practical questions intended to bring out the candidate's knowledge of the subject of the investigation and his knowledge of methods of investigation.

2. Foreign languages, intended to test the candidate's ability to translate into English or vice versa, a passage from the Spanish and, if possible, the Portuguese language.

3. Education and experience of the candidate.

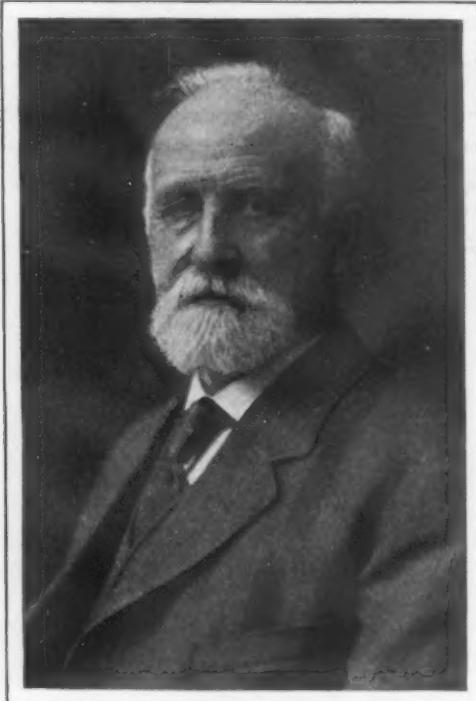
Applicants should have good address and appearance, be able to address public gatherings and must be American citizens. Applications for the position should be made direct to the Bureau of Foreign and Domestic Commerce, Washington, D. C., giving a complete statement of the applicant's education and particularly his experience in the subject to be investigated, and enclosing an unmounted photograph taken within two years. Applicants who successfully pass the written examination may be required to appear before an oral examining board in Washington.

Steel output in the Birmingham district, England, is now less than that of iron. Nothing like the present boom has been known there since the eighteen-seventies. The famous brand of best iron, known as marked bars, has had eight advances, four in succession of \$2.43, and the last one of \$4.86 brought the price to \$65.69. The greatest advance has been in galvanized sheets which in January, 1915, were selling at \$54.74 per ton, but in December were quoted at \$121.66. The district has been severely affected by the steel scarcity, especially as to wire production.

OBITUARY

John E. Sweet

John Edson Sweet, revered as the grand old man of mechanical engineering, the one individual more than any other responsible for establishing the American Society of Mechanical Engineers, professor for a number of years at Cornell University and for years the



JOHN EDSON SWEET

personification of the Straight Line Engine Company, Syracuse, N. Y., died suddenly at Syracuse, May 8.

He was in his 84th year, having been born Oct. 21, 1832, on a farm at Pompey, N. Y. His early education was obtained at district schools, but most of his time out of school was spent with such tools as he could lay his hands on. In 1850 he was apprenticed to a local carpenter and joiner. Shortly after he went to Syracuse to learn drafting as an aid to carpentry and secured a position as office boy with an architect. In return for his work he was permitted to study the plans and practice drawing. For the next nine years he studied in the winter and worked at his trade in the summer. In 1859 he went to Tuscaloosa, Ala., and engaged in business as an architect until the Civil War broke out.

Upon his return to Syracuse in 1861 he spent a short time in the railroad shops as a draftsman and pattern maker. The following summer he went to London to attend a mechanical exhibition and travelled through England, France and Italy. Shortly afterward he entered the employ of Hazeltine, Lake & Co., patent experts of London, as a draftsman and remained there until 1864, when he returned to Syracuse and became identified with Sweet, Barnes & Co. as designer and draftsman. Three years later he visited the Paris Exposition and on his return became works superintendent of Sweet, Barnes & Co. From 1870 to 1873 he was engaged in bridge building and in 1871 and 1872 made the designs for his first straight-line engine.

Leaving Syracuse in 1873 he became an instructor in engineering at Sibley College, Cornell University, and the manner in which he developed the mechanical abilities of his students under discouragements due to lack of equipment and sympathy of the university authorities was one of his greatest accomplishments.

He resigned from that position in 1879 and returned to Syracuse. The Straight Line Engine Company was organized shortly after, with Mr. Sweet as president and general manager.

That winter he proposed the formation of a society of mechanical engineers and the American Society of Mechanical Engineers was organized as a result of his efforts on Feb. 16, 1880. At the time of his death he was the sole survivor of the trio prominent in the founding of the society. He was one of its managers from 1880 to 1883 and president in 1883 and 1884. The John Fritz Medal was awarded to him in 1913 for "his achievements in machine design and for pioneer work in applying sound engineering principles to the construction and development of high speed steam engines."

In 1893 he was one of the machine-tool jury at the Chicago Exposition. He served as the first president of the Engine Builders' Association of the United States from 1899 to 1901 and as president of the Syracuse Metal Trades Association in 1906 and 1907. He was also a member of the Advisory Board of the New York State Branch, National Society for the Promotion of Industrial Education. On Jan. 30, 1914, Syracuse University conferred the degree of doctor of engineering on him. The ceremonies in connection with the granting of the degree were held in the offices of the Straight Line Engine Company, the faculty and trustees of the University going there as a tribute to Dr. Sweet's love for the old place.

Aside from his engine, which was first built with a flyball governor acting upon the peculiar form of link motion and afterward with a highly original shaft governor acting directly upon a single valve, Dr. Sweet was the inventor of a nail machine and a type setting machine and the builder of the first standard measuring machine. The last and the second straight line engine were exhibited at the Centennial Exposition at Philadelphia in 1876.

He left no immediate family, the only survivors being nieces and nephews and relatives by marriage.

ENOS M. BARTON, chairman of the board of directors, and former president of the Western Electric Company, Chicago, died May 3, aged 73 years, at Biloxi, Miss., where he had gone in the hope of regaining his health. As a young man he taught school in western New York, and then took up the occupation of telegraph operator. About 1869 he became interested in a shop for the manufacture of electrical devices at Cleveland, Ohio, which was moved to Chicago a few years later and grew into the Western Electric Company. Since his retirement from active business a few years ago, he had given his attention very largely to the model dairy farm which he owned at Hinsdale, a suburb of Chicago. Mr. Barton was born at Lorraine, N. Y.

WILLIAM JOHN FITZSIMONS, general manager of the Fitzsimons Company, Youngstown, Ohio, maker of cold drawn steel, shafting and special shapes, died May 4 after a few hours' illness from pneumonia, aged 44 years. He had been associated with the company twenty-eight years, and had been manager for fourteen years. He leaves his widow, two sons and two daughters. His father, Thomas G. Fitzsimons, of Cleveland, is president of the company.

GEORGE M. SKYLES, president Ohio Seamless Tube Company, Shelby, Ohio, died May 5 from heart disease, aged 64 years.

GEORGE REEVES, president Reeves Brothers Company, Alliance, Ohio, died at his winter home in Miami, Fla., April 10.

Manganese Ore Imports Lessening

Imports of manganese ore into the United States in February were only 8685 gross tons, against 16,648 tons in February, 1915. This is the smallest month's total since May, 1915. The monthly average for 1915 was 26,732 tons, making the imports thus far in 1916 considerably below the average. For the eight months ended Feb. 29, 1916, the imports were 281,170 tons against 158,587 tons and 193,278 tons for the same periods in 1915 and 1914 respectively.

Machinery Markets and News of the Works

LABOR TROUBLE SUBSIDING

Railroad Buying Promising in the West

General Demand Steady, but Large Inquiries Are Absent—Strike of Machinists Reported on Pacific Coast

The wholesale outbreak of labor trouble in the Middle West which agitators had threatened would come with the first of May did not materialize to the predicted extent. On the contrary, some shops now have more men employed than they had prior to May 1. In Cincinnati, for instance, the employers made a distinct gain, some of the men having returned to work on the Saturday before May 1. At Pittsburgh the Westinghouse strike has completely collapsed. In other cities, also, the situation is improved although a large number of shops are still inconvenienced, but this is due in part to causes other than strikes. In some trades there are not enough workers to go around.

Middle Western railroads are showing interest in the tool market which, it is believed, presages a good business in the near future. The Atchison, Topeka & Santa Fé Railroad has placed orders for a few tools, but other roads which have lists out have not yet closed. In Cleveland it is reported that the Baltimore & Ohio Southwestern will issue a large list shortly and other lists, mostly for replacement, are expected from other lines.

The Eastern railroads are less active as buyers than those in the West, but they are placing a few orders for single tools. The Union Pacific has been quoted on a few machines.

Throughout the country the demand for machine tools is keeping up at a steady pace, although there is a notable lack of large requirements.

In the Detroit territory the automobile industry continues to expand, and several new plants are projected for makers of parts and accessories. The Standard Motor Truck Company, Detroit, will build a three-story reinforced concrete factory to cost \$50,000.

At Findlay, Ohio, the Grant Motor Car Company will build a plant having 124,000 sq. ft. of floor space.

In New York and Pennsylvania new plants and extensions are numerous. The Lefever Arms Company, Syracuse, N. Y., has sold its gun-making business to the Lefever Gun Company, Ithaca, N. Y., recently organized, and will incorporate the Durston Gear Company to take over the manufacture of its automobile transmissions and gears, for which work it will erect a machine shop.

The American Motors Corporation, 141 Broadway, New York, has practically completed negotiations for establishing a plant at Plainfield, N. J., for the manufacture of automobiles, planned to produce 3000 a year.

Estimates are being taken by the Worth Brothers Company, of the Midvale Steel & Ordnance Company, for a machine shop and other shops at Coatesville, Pa.

The Pathé Frères Phonograph Company, Brooklyn, N. Y., has awarded the contract for a seven-story fac-

tory, 85 x 100 ft. The Aluminum Company of America has awarded the contract for an addition to its Niagara Falls plant.

On the Pacific coast there has been little labor trouble, but on May 1 about two hundred machinists employed in local automobile shops went on strike, demanding \$4.50 per day, an increase of 50c. Deliveries are becoming a little easier on the coast, but the demand is still running ahead of the supply. There is a good demand also for machinery other than that used in working metal.

Machinery houses in the Pacific Northwest are having an extremely busy spring, largely because of the great activity in the mining field.

New York

NEW YORK, May 9, 1916.

The general demand for machine tools is steady, and sellers declare themselves satisfied with the situation. The passing of the big rush of buying affords them needed relief, while they still have enough to keep them busy. The largest list before the trade is that of the Midvale Steel Company, which is buying for new shops at Nicetown, Philadelphia.

The Eastern railroads do not appear to be as active in buying as are some of those in the West. Purchases by Eastern lines continue to be mostly of single tools. The Pennsylvania Railroad has yet to close against inquiries it has had out for several weeks. The Union Pacific, 165 Broadway, New York, has been quoted on a few machines.

The McNab & Harlin Mfg. Company, Paterson, N. J., was in the market for some turret lathes, but is understood to have purchased some second-hand machines which had been used on a shell-fuse contract. A few tools have been bought also by the Autocar Company, Ardmore, Pa. A little additional equipment is to be purchased by the Frick Company, Waynesboro, Pa., and the Pyrene Mfg. Company, New York.

The American Can Company, Fourteenth Street and Tenth Avenue, New York, has purchased 66 lots in South Brooklyn, bounded by First and Second avenues, Forty-third and Forty-fourth streets, opposite the Bush Terminal. The company made a canvass of a large number of factory locations in the vicinity of New York before purchasing this site.

The Lefever Arms Company, Syracuse, N. Y., is about to dispose of its business to two new corporations. The Lefever Gun Company, Ithaca, N. Y., will take over the firearm department and the Durston Gear Company, Syracuse, will take over the manufacture of automobile transmissions and gears. As this latter class of work has for some time been taxing the capacity of the plant, the Durston Gear Company will build another machine shop, 40 x 140 ft., two stories, and will add about 100 men to the working force. J. Frank, A. H. and M. H. Durston have been chosen directors of the Durston Gear Company. The amount of the capitalization has not yet been fixed.

Smith & Terry, Inc., commission merchant and ship broker, 116 Broad Street, New York, has purchased the Bethel Shipbuilding Yard at Bethel, Del., and will begin at once on the manufacture of wooden barges to engage in the yellow-pine trade between Jacksonville, Fla., and New York. The plant will employ 40 men. Edwin Smith is president and general manager, and H. A. Terry is secretary and treasurer.

The American Motors Corporation, recently incorporated with a capital stock of \$1,250,000, has established headquarters at 141 Broadway, New York. It has practically completed negotiations for the establishment of a plant at Plainfield, N. J., which it plans to have completed about July 16 and which is to have a capacity of about 3000 cars a year. Louis Chevrolet is chief engineer. W. H. Hoople, president of the Interstate Electric Corporation; J. C. Spiers, formerly general manager of the Autocar Company, and G. F. Baright, formerly advertising manager of the Prudential Insurance Company of America, are backing the new corporation.

The J. W. Ferguson Company, United Bank Building, Paterson, N. J., has the general contract for alterations to the

two-story brick factory building, 161 x 121 ft., in the north side of Seabring Street, Brooklyn, N. Y., 100 ft. east of Richards Street, for J. H. Williams & Co., Inc., 150 Hamilton Avenue, estimated to cost \$18,000.

D. H. Ponty, Depot Square, Portchester, N. Y., has completed plans for a one, two and three-story blacksmith and welding shop, 25 x 133 ft., to be erected on Travers Avenue, for Langer & Rosenberg, at a cost of \$8,000.

The American-LaFrance Fire Engine Company, Elmira, N. Y., has increased its capital stock from \$3,450,000 to \$4,950,000 in the shape of 10-year notes to retire its present floating indebtedness.

The recent additions to the plant of the Hammond Steel & Forging Company, Syracuse, N. Y., also include enlargements to the heat-treating rooms, warehouse and shipping buildings. W. Scott is treasurer.

The North West Aluminum & Brass Foundry, Inc., 14 Riley Place, Rochester, N. Y., has broken ground for a two-story brick foundry, 50 x 118 ft., which will be erected at Villa Street, opposite Curlew Street, at a cost of about \$20,000. It will employ about 100 men. John R. Loysen is president; Charles Tepper, vice-president; George A. Hetzler, secretary and treasurer, and Herman G. Hetzler, purchasing agent.

The Wall Rope Works, 48 South Street, New York, is making alterations to its works at Beverly, N. J., including a narrow-gage railroad operated by an electric storage battery locomotive. It is about to equip its mill with 440-volt, three-phase, electric motors. H. M. Wall is superintendent.

The American Concrete Steel Company, Essex Building, Newark, N. J., has obtained the general contract for the construction of a nine-story reinforced concrete factory building, 100 x 200 ft., at Middlesex and Fourth streets, for the Hyatt Roller Bearing Company, on premises. The plans were prepared by the owner's engineer. The cost is estimated at approximately \$235,000.

John F. Schrink & Son, 164 Emmet Street, Newark, N. J., manufacturing jewelers, have had plans drawn by Frank Grad, American National Bank Building, for a three-story addition to its factory, 30 x 100 ft., to cost about \$25,000.

The Turner Construction Company, 11 Broadway, New York, has been awarded general contract for the erection of a seven-story reinforced-concrete factory, 85 x 100 ft., for the Pathé Frères Phonograph Company, 29 West Thirty-eighth Street, New York. It will be located on Grand Avenue between Flushing and Park avenues, Brooklyn. Helmle & Corbett are the architects.

The Interchangeable Trolley Switch Company, Inc., Syracuse, N. Y., has been organized with a capital stock of \$100,000 to manufacture switches and appliances. W. Dibbs, 400 East Genesee Street; W. A. Wright, 102 Kensington Road and C. W. Blodget, 207 Clarendon Street, Syracuse, are the incorporators.

The Neville Process Dye Company, Freeport, N. Y., is having plans prepared for a factory to be erected on Brooklyn Avenue.

The Aluminum Company of America, Niagara Falls, N. Y., has awarded contract for the erection of a six-story reinforced concrete building, 68 x 93 ft., and a one-story addition to its shipping building, 120 ft. in length. Work will be started at once.

The Empire Rolling Screen Company, Inc., Rochester, N. Y., has been organized with a capital stock of \$75,000 to manufacture rolling screens, etc. H. T. McClains, J. Sayers, Rochester, and W. P. Underhill, East Rochester, are the incorporators.

The Globe Woven Belting Company, 1420 Clinton Street, Buffalo, is erecting a factory, 102 x 140 ft.

The Tollometer Company, Inc., Brocton, N. Y., has been organized with a capital stock of \$50,000 to manufacture watches, clocks, timing devices, etc. The incorporators are O. G. Tague, C. W. Green and C. P. Lawson, Brocton.

The Contact Process Company is erecting a brick addition to its plant at Buffalo River and Buffalo Creek Terminal Railroad.

Philadelphia

PHILADELPHIA, Pa., May 8, 1916.

The Kutztown Foundry & Machine Company, 1421 Chestnut Street, Philadelphia, Pa., will shortly build an addition to its foundry at Kutztown, Pa., 150 ft. long. It has been running day and night for the past year and a half and it is short of men. Its orders are increasing every day.

The Vacuum Oil Company, 61 Broadway, New York, has acquired from A. W. Mellon of Pittsburgh 675 acres in Gloucester County, New Jersey, having a frontage on the Delaware River of over one mile. It has put a force at work in grading and dredging and will begin the construction of

wharves and docks. It is said that the plant to be erected on this site will be larger than any two of its present plants at Bayonne, N. J., Olean and Rochester, N. Y.

Fire at the plant of the Camden Foundry Company, Camden, N. J., April 26, destroyed its casting and molding shop with a loss of \$12,000. William B. Cannon is vice-president.

The Sherritt & Stoer Company, 603 Finance Building, Philadelphia, has been appointed sales agent of the Gardner Machine Company for the Philadelphia district and will carry its line of disk grinding machines, ball bearing polishing machines, etc. M. A. Sherritt is vice-president and general manager.

Carl P. Berger, South Penn Square Building, Philadelphia, is preparing plans for a two-story factory, 80 x 130 ft., to be erected at Sepiva and Butler streets, for the Belmont Packing & Rubber Company.

Contract has been awarded by the New Jersey Leather Company, Camden, N. J., to A. Raymond Raff, 1635 Thompson Street, Philadelphia, for the erection of a two-story and basement brick factory, 110 x 250 ft., to cost about \$55,000.

It is reported that estimates are being taken by the Worth Brothers Company, Coatesville, Pa., for a machine shop, blacksmith shop and yard, 133 x 326 ft., from private plans.

The John Illingworth Steel Company, Lewis Street and Tacony Avenue, Philadelphia, has received a permit for a one-story frame and iron foundry, 12 x 27 ft., to cost about \$2,500.

Morgan M. Bynon, 4632 North Broad Street, Philadelphia, Pa., has awarded contract to G. E. Pierson, 4507 North Twentieth Street for the construction of a one-story brick automobile and tire repair shop to cost about \$1,000.

The Penn Iron Company, Philadelphia, has been incorporated, with a capital stock of \$25,000, by George S. Law, Edgewood Park; Aubrey L. Ashby, 417 North Denniston Avenue, Pittsburgh, and William E. Miller, 1109 King Street, Pittsburgh, to manufacture war munitions, engines, machinery and motors.

The Fairmount Mfg. Company, Philadelphia, has been incorporated with a capital stock of \$10,000, by William R. Jackson, 1515 North Street; George T. Phipps, 1231 West Dauphin Street, and Fuentes Phipps, 2251 North Camac Street, to manufacture tools and implements.

The Rudolph Wurlitzer Company of Pennsylvania, Philadelphia, has been incorporated with a capital stock of \$5,000, by Harry V. Metzel, Howard E. and Rudolph H. Wurlitzer, Cincinnati, Ohio; Farney R. Wurlitzer, North Tonawanda, N. Y.; Howard E. Heckler, 4460 North Uber Street, Philadelphia, and E. Grewe, 2635 North Franklin Street, Philadelphia, to manufacture musical instruments.

The Hamilton Garages Company, Philadelphia, has been incorporated, with a capital stock of \$10,000, by Harrie H. Fouse, 4335 Pine Street; Ruth Hoenn and James M. Kilbourn, 1010 Spruce Street, Philadelphia, to erect garages and maintain repair shops.

Naughton & Weimar, Inc., Philadelphia, have been incorporated, with a capital stock of \$10,000, by Michael Naughton and John F. Naughton, 221 West Berkley Street; Michael P. Weimar, 1413 West Wyoming Street, and James T. Weimar, 2533 North Marshall Street, to manufacture machinery.

The Graves Timing Device Company, Philadelphia, has been incorporated with a capital stock of \$35,000 by C. H. Graves, 4811 Walnut Street; C. L. Bundy, 1236 North Thirty-first Street, and William A. Sachs, 1726 North Franklin Street, to manufacture timing devices and office supplies.

Baltimore

BALTIMORE, Md., May 8, 1916.

The Hess Steel Company, Biddle Street and Loney's Lane, Baltimore, has about completed its new plant. Machinery is being installed in the rolling mills.

The Baltimore Copper Smelting & Rolling Company, Canton, Md., has cut its work day from 10 to 8 hr., which means an increase in pay for the employees.

The Schlutter-Zastrow Machine Company, Baltimore, has been incorporated with \$10,000 capital stock by C. F. Schlutter, 2101 Calverton Road; George W. Zastrow, 1404 Thames Street; John J. May and John Rasch.

With \$100,000 capital stock the National Paper Products Corporation, Baltimore, has been incorporated by J. Paul Schmidt, 720 Law Building, E. G. S. and Charles S. Ricker.

Ways to accommodate four 250-ft. schooners will be constructed by the McLean Contracting Company, Fidelity Building, Baltimore.

O. B. Wight, architect, Munsey Building, it is said, will prepare plans for a four-story building for the Autocar Company, Ardmore, Pa., to be used as shops.

A garage and repair shop will be erected in Brooklyn, Md., for William Smith. The contract has been awarded to James Ore, Patapsco Avenue and Seventh Street, Brooklyn, Md.

With \$35,000 capital stock, the Pen-Mar Furnace Company, Hagerstown, Md., has been incorporated to manufacture furnaces. The incorporators are Frank L. Bennett, 122 South Antietam Street, Hagerstown; Charles F. Lane, Jr., and Richard G. Stevenson.

With \$25,000 capital stock, the Roanoke Automobile & Implement Company, Roanoke, Va., has been organized by J. H. and J. A. Bear.

Fire on May 6 did damage amounting to about \$8,000 to the machine foundry of Flynn & Emrich, Saratoga and Holliday streets, Baltimore.

New England

BOSTON, MASS., May 8, 1916.

The freight situation in New England is increasing in seriousness. The New Haven lines have lost ground and the number of cars on their rails has increased. Last Friday the total had reached 51,595 cars, nearly 7000 more than the accepted capacity of the road. On May 3 it became necessary to put a stringent embargo on the cities of Hartford, Waterbury, Bridgeport and Torrington, Conn. The embargo excepts for these points the following raw materials for metal working industries when in carload lots: Copper, spelter, zinc, pig lead, crucibles, scrap brass and German silver. Coal, pig iron, steel and other much-needed materials are not accepted from connecting lines or steamship lines from a long list of East River piers. Such goods delivered by teams to the Harlem River or Brooklyn terminals will not be accepted. The embargo against other portions of the New Haven territory, particularly the Massachusetts cities, is more lenient and the situation is less acute. Embargoes are placed against specific concerns in various places owing to the accumulation of freight for them. It is necessary to have the latest issue of the embargo notices in order to be certain that freight of any kind will be accepted at the shipping point.

When the embargoes were temporarily lifted a short time ago, many consignees found from 12 to 50 or 60 cars dumped in upon them almost over night. Even under normal conditions, it would be impossible to unload these within the demurrage limits. With the greatest scarcity of laborers and only the normal trucking facilities, the result of the inrush of consignments has been a degree of freight congestion exceeding that of the first crisis. The failure to release the equipment of the Western roads has prevented them from adequately handling the business offered them, and, although they are getting large sums for car hire, they are claiming a loss of millions of gross revenue owing to the congestion of the Eastern roads.

The Gilbert & Barker Mfg. Company, West Springfield, Mass., is preparing to double the capacity of its plant. Plans are being drawn for buildings which will give a total plant area of about 7½ acres and will call for an increase in the working force of 400 to 500 hands. An addition, 60 x 200 ft., two stories, will be made to the machine shop; an addition, 160 x 160 ft., one story, to the sheet-metal shop; an addition of two stories to the present one-story storage building; and the erection of a one-story lumber storage building, 15 x 120 ft. The welding plant will be doubled in area, and machinery installed for the generation of oxygen by electrolysis of water. The power plant will be enlarged and a new engine and boiler added. Other improvements will be made. The business of the company in the manufacture of oil and gasoline storage tanks and accessories of the oil business is increasing rapidly and both foreign and domestic orders are pouring in.

The Asa S. Cook Company, Hartford, Conn., is to build an addition, 28 x 80 ft., one story.

Hanson Brothers, Plainville, Conn., are installing equipment in an addition just completed.

The American Graphophone Company, Bridgeport, Conn., has purchased the corset factory of the Birdsey-Somers Company, on Barnum Avenue, Bridgeport. The plant is a large building, and it is the intention of the purchaser to make extensive alterations and to erect other buildings. It will be used for the manufacture of records and will employ about 3000 workers. It is probable that work on the new structures will begin before June 1.

The Cushman Chuck Company, Hartford, Conn., has awarded a contract for an addition, 30 x 31 ft.

The Jacobs Mfg. Company, Hartford, Conn., expects to have its new factory on Park Street in operation early in June.

The Harley Mfg. Company, Springfield, Mass., founder and forger, has been incorporated with capital stock of \$50,000. Leon J. Harley, Jr., is president; Leon J. Harley, treasurer; and W. J. McClintock is the other incorporator.

The new plant of the Stanford Steel Products Company, Milford, Conn., is practically finished, and it is expected that it will be in operation June 1.

The Derby, Conn., Gas Light Company is having plans drawn for an addition to its electric power station to cost \$30,000.

Scott & Williams, Laconia, N. H., have awarded a contract for an addition to their machine shop, 40 x 200 ft., one story.

The Albert & J. M. Anderson Mfg. Company, Boston, Mass., maker of electrical goods, has placed contract for a factory in South Boston, 100 x 120 ft., one story.

The Belcher Malleable Iron Company, Easton, Mass., has been incorporated with capital stock of \$10,000 by E. C. Belcher, president; Clifford Belcher, treasurer, and R. G. Page.

The Foster Machine Company, Westfield, Mass., has given its employees a 10 per cent increase in wages.

It is reported that the Farist Steel Company, Bridgeport, Conn., whose plant was recently destroyed by fire, has decided not to build upon the old site and has settled upon no definite plans for the future.

The Stamford Rolling Mills Company, Stamford, Conn., will begin work at once upon an addition, 50 x 123 ft., two stories. The company now has several buildings in course of erection.

The Standard Company, Torrington, Conn., is having plans drawn for an addition to its factory on Laurel Avenue.

The American Brass Company has awarded a contract for a large power plant for its Coe Brass branch at Torrington, Conn., to Westinghouse, Church, Kerr & Co., New York City.

Chicago

CHICAGO, ILL., May 6, 1916.

The Atchison, Topeka & Santa Fe Railroad has placed orders for a few tools for which it has been quietly in the market. No purchases have as yet been made against bids submitted on the lists sent out by the Chicago & Northwestern and the Chicago, Burlington & Quincy. Whether or not the Illinois Central inquiry will result in buying the tools listed is less certain, as it is understood that estimates have yet to be prepared from the quotations received. Some new export inquiry and a fair business in small lots of tools for the local manufacturing trade is reported. A very good local business in foundry equipment, including molding machines and cupolas with accessory apparatus, exists. A large number of foundry extensions are noted. Shortage of labor is a heavy and increasing handicap both in curtailment of machine-tool production and the limitation of buying for plants unable to maintain the rate of activity which available business would make possible.

The Ford Motor Company, Chicago, has let the contract for an additional factory in connection with its local assembling plant, 56 x 365 ft., two stories, to cost \$60,000.

The Kohl Mfg. Company, Chicago, through M. J. Moorehouse, architect, 343 South Dearborn Street, is receiving bids for a four-story, reinforced concrete factory, 159 x 185 ft., to be erected at Western Avenue and Thirty-third Street.

The Link Belt Company, Chicago, is erecting a steel fabricating shop and boiler house on Thirty-ninth Street opposite its local plant.

The D. O. James Mfg. Company, Chicago, specialist in gear cutting, has under way the addition to its plant at West Monroe Street to cost \$15,000.

The Pondeck Piston Ring Company, Cicero, Ill., has increased its capital stock from \$30,000 to \$75,000.

The Chicago Hinge Cover Support & Balance Company, Chicago, has been organized with a capital of \$25,000 by Leonard J. Hall, 5526 Magnolia Avenue, James L. Abbott and Frank E. Levanseler.

The Adding Machine Sales & Mfg. Company, Chicago, has been incorporated by Vincent L. Hughes, 1411 East Eighty-sixth Street, L. A. Brown and Herman Bergman, with a capital of \$7,500.

The Vermillion Malleable Iron Company, Hooperston, Ill., is building an addition to its foundry, 50 x 100 ft.

The Roesch Brothers Plating Works, Belleville, Ill., will erect a new shop at a cost of \$2,500.

The Peters Brothers Mfg. Company, Algonquin, Ill., maker of tapping chucks and ironing machines, is building an addition to its plant to cost \$15,000.

The Horace Clark Mfg. Company, Peoria, Ill., has been organized with a capital of \$110,000 by J. W. McDowell, George T. Page and Gerald H. Page.

The Trump Mfg. Company, Crown Point, Ind., has been incorporated with \$10,000 capital stock to manufacture self-propelled vehicles, including aeroplanes. The directors are George I. Trump, Peter Bohr and John Horst.

The Fibreweb Company, Kewanna, Ind., has been incorporated with \$15,000 capital stock to manufacture fiber board. The directors are W. E. and L. W. Bundy and Daniel H. Snapp.

The Acme Specialty Company, Indianapolis, Ind., has been incorporated with \$10,000 capital stock to manufacture automobile specialties. The directors are William F. Hiatt, Daniel M. Moroney, John P. Finn, M. J. Moroney and E. M. McAdams.

Martin C. Schwab, consulting engineer, Mallers Building, Chicago, has prepared plans and specifications covering power plant, piping and accessories for a new powerhouse at the Alton State Hospital, Upper Alton, Ill.

The Tom Thumb Tractor Company, Minneapolis, Minn., is considering plans for acquiring the plant of the Pedeler Car Company, St. Paul, which will provide facilities for considerable expansion. George C. Jones, Minneapolis, is president.

The Hindman Die & Tool Works, Marshalltown, Iowa, was damaged by fire to the extent of \$5,000.

The Brite-Lite Company, Albert Lea, Minn., will erect a two-story factory to cost about \$25,000.

The Ford Motor Company, Detroit, Mich., has purchased property in Des Moines, Iowa, on which it will erect a six-story branch assembling plant.

Cleveland

CLEVELAND, OHIO, May 8, 1916.

Considerable new demand for machinery from the railroads is indicated by some tentative inquiries that have come out. It is reported that the Baltimore & Ohio Southwestern will issue a large list shortly and that lists will also be sent out by the Michigan Central, Rock Island and Chicago & Alton. Railroad buying at present is largely for replacements. The local market is devoid of any inquiries for round lots of machine tools, but demand for single tools is holding up fairly well. Very little labor trouble has developed in this city recently, but a few minor strikes have occurred in northern Ohio. The scarcity of labor is still a serious problem with most metal-working plants which are unable to operate at maximum capacity because of inability to secure the men needed.

The Grant Motor Car Company, Findlay, Ohio, will shortly move to Cleveland where it will build a plant providing 124,000 sq. ft. of floor space, at Coit Road and Kirby Avenue, along the Belt Line Railroad. Considerable equipment will probably be required.

The Ferry Cap & Set Screw Company, Cleveland, has increased its capital stock from \$100,000 to \$500,000 and has commenced the erection of an addition, 48 x 225 ft., one half to be one story and the remainder two stories. This will be used for warehouse and shipping purposes, providing a large increase in space for manufacturing now occupied by these departments. New machinery will be installed.

The Roubay Company, recently incorporated, has purchased the automobile body manufacturing plant of the G. D. Hutchcroft & Son Company, Cleveland, and it is stated an extension to the plant will be erected within the next few months. Leon Roubay is president.

The Aetna Foundry & Machine Company, Warren, Ohio, is enlarging its foundry by an extension, 40 x 80 ft., and has recently completed a structural shop, 40 x 50 ft.

The Warren City Tank & Boiler Company, Warren, Ohio, is moving into its new plant which, when entirely completed, will be 200 x 875 ft. The present plant will be occupied by the German-American Car Company, which will also occupy a new building, 60 x 260 ft., to be built shortly. This company is now located in a building which will be torn down to provide space for completing the plant of the Warren Company.

It is reported that the Sommer Motor Company, Bucyrus, Ohio, will shortly begin the erection of a new factory, 100 x 200 ft.

The American Stamping & Enameling Company has placed its new plant in Massillon, Ohio, in partial operation.

The Ideal Wheel Company, Massillon, Ohio, has increased its capital stock from \$50,000 to \$150,000 to provide additional capital to erect a new factory building. It manufactures wheels with steel spokes, designed for use on solid rubber tires.

The National Mfg. Company, Orrville, Ohio, has sold its plant to the National Engineering & Mfg. Company, which plans to move it to Canton, Ohio.

The Portage Machine & Engineering Company, Akron, Ohio, has been incorporated with a capital stock of \$10,000 by John Zimarik, Adam Pamer and others to manufacture machinery.

The Bay View Foundry Company, Sandusky, Ohio, has commenced the erection of an addition, 100 x 150 ft., which will double its capacity.

Cincinnati

CINCINNATI, OHIO, May 8, 1916.

The machinists' strike here, called May 1, has proved to be a failure, although in a number of shops some inconvenience was caused. Figures compiled by competent authorities, including every affected manufacturing plant in this immediate vicinity, show that less than 16 per cent of the workmen failed to report for duty the first day of the strike. The exact figures embracing 98 plants are as follows:

Number out on May 1.....	1,930
Number of men who remained at work.....	11,700
Number of strikers who returned to work up to May 5.....	349
Number of additional strikers.....	20
Net gain in workmen for the employers.....	329

A number of machinists also returned to work on Saturday, which fact is considered rather significant as presaging an early end of the trouble.

Reports as to labor conditions in nearby manufacturing cities show that the employers have been making steady gains. A large plant in Piqua, Ohio, that was closed down two weeks ago, is now operating with a good-sized force. The patternmakers' strike at Hamilton, Ohio, is still inconveniencing two shops there and one foundry is affected in a limited way by a molders' strike called some time ago. The molders are also out in several foundries at Springfield, Ohio.

The demand for machine tools is still somewhat slow, and both domestic and foreign buying is far behind the record for the corresponding period of last year. Second-hand machines are more plentiful, but good rebuilt machines are still bringing good prices where prompt deliveries can be made.

The Union Iron & Steel Company, Cincinnati, Walter Murphy, president, will soon move from its present location at Second and Elm streets to the former plant of the Globe Automatic Sprinkler Company, on Reading Road. The new location gives the company over two acres of yard and warehouse space. A considerable amount of equipment will be required, including traveling cranes, lifting magnets, cutting-off saws, etc.

The Peters Cartridge Company, First National Bank Building, Cincinnati, is receiving estimates for a power plant and equipment for its plant at King's Mills, Cincinnati suburb. The company is just now completing an addition to its plant, 62 x 316 ft., three stories.

The Cincinnati Fireproof Door Company, Cincinnati, will soon commence construction of a plant in Milford suburb.

The Fyre-Fyter Company, Dayton, Ohio, has been incorporated with \$300,000 capital stock to manufacture fire extinguishers for automobiles. B. H. Phister, Cincinnati, is said to be a promoter of the new company.

The Robbins & Myers Company, Springfield, Ohio, has decided to add a fifth story to a large manufacturing addition to its plant now under construction.

The Westcott Motor Car Company, Richmond, Ind., will soon move its plant to Springfield, Ohio, where a manufacturing building has been secured. Equipment will be added for increasing its present output.

The Hercules Mfg. Company, Springfield, Ohio, has commenced the work of moving its plant to Canton, Ohio.

The Lagonda Mfg. Company, Springfield, Ohio, has been acquired by the Elliott Company, Pittsburgh, Pa., and it is announced that the Springfield plant will be enlarged at an early date. The company manufactures tube cleaners and steam specialties.

The White Star Pearl Laundry Company, Springfield, Ohio, will install a 100-hp. boiler in its plant on Linn Street.

The Yardley Screen & Weather Strip Company, Columbus, Ohio, is reported to be contemplating further additions to its plant.

It is rumored that the Miami Trailer Company, Troy, Ohio, contemplates enlarging its plant at an early date.

The C. D. Mfg. Company, Marietta, Ohio, whose incorporation was recently noted, is fitting up a factory to manufacture automobile accessories.

The Champion Machine & Forging Company, Painesville, Ohio, has increased its capital stock from \$125,000 to \$250,000.

Milwaukee

MILWAUKEE, Wis., May 8, 1916.

The labor situation in metal-working lines is fairly quiet. Other trades are not so fortunate, however, and serious trouble is being encountered. At the Globe Seamless Steel Tube plant strikers made a demand for an increase from 22 to 25c. per hr. For a time a strike of 700 workmen of all classes was threatened. Employers are still apprehensive, although representatives of the Machinists' Union have intimated that the demand for an 8-hr. day at the former wage will be advanced in a friendly spirit. The organized machinists are claimed to number 6400.

Production is going along at a high level. Machine-tool bookings aggregate a good volume, but large-lot requirements are absent. Single tools are taken as rapidly as available. Mining machinery is in active demand both for export and domestic use. Crane builders are still forced to turn away orders. Plant extensions continue at a brisk rate, although many have been deferred because of unsatisfactory delivery of tool and other equipment. New garages are picking up all the light tools the used machinery market can get hold of, and also are buying a large volume of new tools. Prices on arbor presses, small lathes, drill-presses and others have advanced.

Reports state that the Gillette Safety Tire Company, Eau Claire, Wis., is meeting with much difficulty in getting delivery of the complete equipment for its new tire and rubber factory, now under construction. Advices have been received that some of the machinery cannot be delivered until late fall.

The Spring City Foundry Company, Waukesha, Wis., is erecting an addition to its works, 55 x 60 ft., to be completed in about two weeks. H. E. Blair is president.

The Superior Box Company, Superior, Wis., will build a sawmill and other additions to its plant at an estimated cost of \$40,000.

Lorenz Nehrbass, Milwaukee, is building a garage and repair shop on Oakland Avenue, near Park Place, 59 x 120 ft., one story and basement, to cost \$8,000.

The Smalley Mfg. Company, Manitowoc, Wis., manufacturer of agricultural implements, has resumed operations after an interruption of 60 days, while another story was added to the main shop and new power and boiler equipment installed.

The Wood Products Company, Ladysmith, Wis., is building three mill additions, 28 x 96 ft., 18 x 96 ft., and 12 x 46 ft. A 160-hp. Corliss engine has been purchased.

The Saxe Brothers, Milwaukee, have incorporated the Lampe-Highland Mine Company, with \$50,000 capital. The contract for a mill and powerhouse costing \$15,000 has been awarded to the Galena Iron Works, Galena, Ill.

The Malleable Iron Range Company, Beaver Dam, Wis., awarded the contract to the Hutter Construction Company, Fond du Lac, Wis., for its shop addition.

The U. S. Steel-Concrete Tie Company, Milwaukee, has increased its capital stock from \$100,000 to \$500,000 to increase its output of reinforced concrete railroad ties. The officers are: President, E. M. McVicker; vice-president and general manager, L. W. Ashley; secretary and treasurer, G. E. G. Kuechle.

The Blizzard Refrigerating Machine Company, Milwaukee, has been incorporated with a capital stock of \$8,000 by O. H. Gaulke, L. Pierron and C. Schweinle.

The Dings Electro-Magnetic Separator Company, 671 Smith Street, Milwaukee, has increased its capital stock from \$10,000 to \$100,000 and changed its name to Dings Magnetic Separator Company. It will operate on a larger scale.

The Storle Engine Company, Kewaunee, Wis., organized two years ago to manufacture an internal combustion engine, is about to begin operations in the former plant of the Storle Valve Company.

John Obenberger, a well known Milwaukee drop forging producer, who recently retired from the Obenberger Drop Forge Company, Cudahy, now the Ladish-Obenberger Drop Forge Company, has organized the John Obenberger Forge Company, with a capital stock of \$100,000, and will establish a plant in the West Allis district.

The B-B Mfg. Company, Racine, Wis., has been incorporated with a capital stock of \$10,000 by Charles S. Beebe and W. G. Gittings to make metal and wood toys and novelties.

The Wood County Cooperage Company, Grand Rapids, Wis., has awarded contracts for the erection of a new factory, 100 x 20 ft., two stories and basement. Jacob Searies is president.

The Thom Automobile Company, Oshkosh, Wis., recently incorporated with \$50,000 capital stock, will build a garage

and machine shop, 100 x 115 ft., two stories and basement. The work is in charge of J. F. Dreger.

The Morgan Company, manufacturer of hardwood products, Oshkosh, Wis., has awarded the general contract for another three-story mill unit, 75 x 200 ft., to cost \$40,000. Equipment is being purchased.

The H. C. Kettelson Machinery Company, Milwaukee, has been incorporated with a capital stock of \$25,000 by Harry C. Kettelson, W. H. Lawton and R. Lawler.

The Cascade Electric Service Company, Cascade, Wis., has been incorporated with a capital stock of \$20,000 to furnish power and light to municipal and private consumers. Otto, John and Minnie Schleifer are the incorporators.

The North End Foundry Company, Sixtieth Avenue, West Allis, Wis., has increased its capital stock from \$35,000 to \$75,000 and is arranging to extend its facilities.

The Central South

LOUISVILLE, Ky., May 8, 1916.

"Getting worse" is the way one Louisville manufacturer states that the demand for power equipment exceeds the present manufacturing capacity more and more, due largely to difficulties in getting material and the general crush of hurry-up orders. There seem to be no signs of a let-up, except that some jobbing lines are beginning to slacken. Electrical plant requirements are in brisk demand and no diminution is to be noticed in the orders for machine tools. Representatives of some of the machinery houses complain that they have sold themselves out of jobs.

The Electrical Prepaying Meter Company, Louisville, Ky., organized by N. D. Abell, H. R. Abell and J. D. Sheridan, with a capital stock of \$50,000, will manufacture electrically controlled measuring devices.

A new varnish plant, to supplement the present one of the Louisville Varnish Company, Fourteenth and Maple streets, Louisville, will be equipped at the old Purified Petroleum Products Company plant, Floyd Street and Eastern Parkway. Additional buildings are also projected. P. H. Callahan is president.

Extensive improvements are being made to the plant at Fourteenth and Hill streets, recently purchased by the Jefferson Woodworking Company, Thirtieth Street and Grand Avenue, Louisville. R. L. Mercke is secretary and treasurer. The company's capital will be increased from \$25,000 to \$100,000.

S. T. Benson, Adarville, Ky., and Chicago interests have leased 900 acres of coal land near Moorman, Ky., and project an extensive development, including a railway extension and a line of coal barges.

The Ashland Iron & Mining Company, Ashland, Ky., has contracted with the Ohio Valley Electric Light Company for power to operate the entire plant, which will be erected at a cost of \$2,250,000, said to be the first plant of its kind operated by electricity.

R. N. Hudson, Louisville, president of the Louisville, Henderson & St. Louis Railway, Cloverport, Ky., has announced that definite plans have been formed to rebuild the shops of the company recently destroyed by fire.

The American Metallic Packing Company, Lexington, Ky., announces that it is still in the market for a used 10 x 10 x 10 steam-driven air compressor, Ingersoll-Rand preferred, a used 5 or 6-ton tandem steam road roller and a used locomotive crane, about 10 tons, arranged for bucket.

W. N. Stire, Cereulan, Ky., is considering the installation of an ice-manufacturing plant.

The George Katzman Company, Third and Walnut streets, Louisville, has incorporated at \$12,000, and will manufacture jewelry. F. B. Boyes and Pierre F. Stockler are also incorporators.

J. H. Livar, 172 South Front Street, Memphis, Tenn., is asking for information as to machinery for washing sand and gravel.

The Newsom Auto Tire Vulcanizing Company, Memphis, Tenn., has been incorporated with \$75,000 capital by Thornton Newsom, L. R. Forsdick and Louis LeRoy.

J. H. Talent, Dayton, Tenn., is asking for prices and information on machinery for manufacturing plow handles.

H. J. Moore, Sweetwater, Tenn., is in the market for a steam shovel with a $\frac{1}{2}$ -yd. dipper.

Additions will be made immediately to the plant of the Florence Pump & Lumber Company, maker of dining tables, Memphis, Tenn. C. B. Dempster, Beatrice, Neb., is president. George C. Roberts is manager.

The Kinzel-Thompson Sand & Gravel Company, 317 Jackson Street, Knoxville, Tenn., has been organized with \$30,000 capital. A plant will be equipped to handle sand and gravel. M. E. Thompson is president, W. C. Kinzel, vice-president and manager.

Lexington, Ky., will shortly let contract for the completion of the city sewer system and the construction of a large sewage disposal plant, having a bond issue of \$300,000 for the work. The Solomon-Norcross Company, Atlanta, Ga., is the engineer.

W. S. Williams and W. F. Prow, Dixon, Ky., will occupy a garage, 60 x 100 ft., to be erected for them.

The Memphis Furniture Mfg. Company, Memphis, Tenn., will erect a two-story addition to its plant, 150 x 200 ft., of brick construction, to cost \$15,000.

Detroit

DETROIT, MICH., May 8, 1916.

The Standard Detroit Tractor Company, Detroit, has been incorporated to manufacture farm tractors and will begin operations in a factory at 1506 Fort Street, West. Among the stockholders are Martin L. Pulcher, Charles F. Mellish and Frank G. Jacobs.

The Iceless Refrigerator Company, Detroit, has been incorporated and will erect a plant in Detroit to manufacture a special refrigeration appliance. The incorporators are O. E. Vessells, David M. Mark and Thomas L. Dalton. Temporary offices have been established in the Hammond Building.

The Standard Motor Truck Company, Detroit, will build a three-story reinforced concrete factory, 130 x 153 ft., to cost \$50,000.

The Detroit Copper & Brass Rolling Mills, Detroit, is erecting an addition to its plant to cost \$16,000.

The Hall Lamp Company, Detroit, manufacturer of automobile accessories, has increased its capital stock from \$300,000 to \$750,000.

The Alloy Steel Spring Company, Detroit, manufacturer of automobile springs, has increased its capital stock from \$100,000 to \$250,000.

The Crescent Brass Pin Company, Detroit, manufacturer of small brass specialties, is erecting a two-story factory, 36 x 120 ft., which will cost \$10,000.

The Walker Joint Company, Detroit, has been incorporated with \$100,000 capital stock to manufacture automobile parts. The incorporators are George Walker, A. H. Lindley and C. M. Devlin.

The National Can Company, Detroit, is adding a three-story addition to its plant.

The Auto Body Company, Lansing, Mich., has broken ground for the erection of a five-story addition to its plant, 120 x 133 ft.

The Douglas & Rudd Mfg. Company, Bronson, Mich., maker of automobile accessories, has let contracts for an addition to its factory that will more than double its capacity.

The Grand Rapids Blow Pipe & Dust Arrester Company, Grand Rapids, Mich., has had plans prepared for a new factory, 50 x 220 ft., as well as plans for a branch factory, 62 x 144 ft., to be built at Detroit.

The Wilson Mfg. Company, Appleton, Wis., manufacturer of wooden articles, will remove its business to Menominee, Mich., where a two-story factory will be erected.

The Welch Furniture Company, Grand Haven, Mich., will remove its plant to Grand Rapids, Mich., where a new factory will be erected.

The Kent Steel & Construction Company, Grand Rapids, Mich., has purchased property upon which it will erect a shop.

The Gold Valve Engine Company has been organized, with a capital of \$60,000, to build gasoline engines. A plant will be erected at Charlotte, Mich. George M. Fenn, president Fenn Mfg. Company of that city, is president and treasurer.

Birmingham

BIRMINGHAM, ALA., May 8, 1916.

Repairs on furnaces, activity at car shops and mill and mining and other industrial betterments of a considerable volume in Alabama have called for a large amount of machinery and machine tools. The getting of them is still very difficult. Contractors will not guarantee time limits and manufacturers will not guarantee delivery. Electrical apparatus and sawmill equipment are also on the active list. Business generally is good, with indications of a rather persistent improvement indefinite in period.

The National Pipe & Foundry Company has been incorporated by A. H. Campbell, Gadsden, and A. M. Shook, Jr., and Wiley Alford, Birmingham, with a capital stock of \$75,000. It will build sanitary iron pipe works at Attalla,

Ala., using hydroelectric power furnished by the Alabama Power Company.

The Southern Clay Mfg. Company, Chattanooga, Tenn., has purchased the properties of the Graves Shale Brick Company, Birmingham, Ala., and will operate it. W. M. Lasley is president.

The Anniston Steel Company, has been incorporated with a capital of \$3,000 by F. H. Chamberlain, manager of the Alabama Power Company, and others, as holding company of the Anniston Ordnance Company.

The New Riverside Ochre Company, Cartersville, Ga., has increased its capital stock from \$20,000 to \$50,000.

The Dixie Pressed Steel Wheel Company, Atlanta, Ga., has been incorporated with a capital stock of \$100,000 by G. Bennington, D. K. Johnson, and others. Plans will be announced later.

The Fitzgerald Iron Works, Fitzgerald, Ga., has been organized by E. N. Davis, Stanley Davis, and others, with a capital stock of \$20,000.

The Central Crate Company, Orlando, Fla., capital stock \$50,000, has been incorporated by F. R. Hocker, Ocala, Fla., and others, to manufacture crates.

The Bayshore Foundry Company, Pensacola, Fla., capital stock \$5,000, has been incorporated by W. N. Ford, J. A. Stauter, and others.

The Tampa & Eastern Traction Company, Tampa, Fla., incorporated with capital stock of \$750,000, plans to build an electric line from Tampa to Lakeland, furnish light, heat, etc. F. W. Cole, E. H. Binford, and others, are stockholders.

The Merrill-Stevens Company has begun to convert an old plant in Jacksonville, Fla., into a shipbuilding plant.

St. Louis

ST. LOUIS, Mo., May 8, 1916.

Buying in the machine-tool market continues good and dealers are reporting increasing ability to take care of customers' needs, though they are still a long way from a satisfactory state in this respect. No large lists are appearing in the market, it being the practice now to buy tools whenever and wherever found, so far as prompt deliveries are concerned, while future deliveries are largely a matter of placing orders rather than putting out lists for bids. Second-hand equipment is almost entirely cleaned up. Investment funds are quite readily available.

The American Packing Company, St. Louis, Mo., has been incorporated with a capital stock of \$50,000 by Karl Hein, Louis Bender and Henry W. Kroeger to equip a packing house plant.

The Tillinghast Chemical Company, St. Louis, Mo., has been incorporated with a capital stock of \$50,000 by G. F. Tillinghast, Louis Oehmsted and E. Neuman to equip a chemical and dye manufacturing plant.

The R. H. Hunstock Chemical Company, St. Louis, Mo., has been incorporated with a capital stock of \$50,000 by Charles C. Engel, Wallace Crossley and W. R. Mayne and will equip a plant for the manufacture of coal-tar dyes.

The Doxsee Electrical Company, St. Louis, Mo., has leased new quarters at 1413 Pine Street, St. Louis, which will be equipped for electrical manufacturing and repair work, etc.

The Universal Auto Shipping Shoe Company, St. Louis, Mo., is in the market for equipment for the completion of shipping shoe castings made under contract by foundries.

The American Wire Thread Company, Kansas City, Mo., has been incorporated with a capital stock of \$45,000 by A. G. Brooks, J. T. Edling and K. D. Klemm to manufacture steel and iron wire products.

The Plattsburg Water Company, Plattsburg, Mo., will construct a waterworks plant at a cost of about \$40,000. Three electrically-driven centrifugal pumps will be required. E. B. Murray & Co., Kansas City, Mo., are the engineers.

The shops of the Missouri Pacific Railway in the East Bottoms at Kansas City, Mo., have been burned with a loss of \$6,000 on machinery equipment. E. A. Hadley, chief engineer, St. Louis, Mo., has charge of replacement plans.

The Farmers Union, Swifton, Ark., will equip a cotton gin to cost about \$12,000. James N. Noon is manager.

M. Bush & Bros., Little Rock, Ark., will equip a brick garage, 50 x 140 ft., with a machine shop and repair plant, requiring machinery to cost about \$5,000.

The St. Louis, Iron Mountain & Southern Railway, St. Louis, Mo., E. A. Hadley, chief engineer, will equip an 8-stall roundhouse and machine shop at Gurdon, Ark.

The Texarkana Water Corporation, Texarkana, Ark., will extend its pumping station equipment, adding a centrifugal pump of 2,500,000 gal. per day capacity as well as other machinery.

The Dougherty Gin Company, Dougherty, Okla., has been

Incorporated with a capital stock of \$15,000 by John L. Case, B. L. Mitchell and C. B. Mitchell, all of Wynnewood, Okla., to establish a cotton ginnery.

The Sinclair Oil & Refining Corporation, a recent consolidation of a number of Oklahoma plants, headquarters at Tulsa, is proceeding with plans for a pipe line and pumping stations for a line to St. Louis, Mo., and the equipment of a large refinery at that point.

The Donnell Tank Protector Company, Tulsa, Okla., has been incorporated with a capital stock of \$50,000 by Victor Clifford and others and will equip a plant.

Wellston, Okla., will install waterworks equipment to cost about \$17,000, including two natural gas engines, with pumps connected, etc. The consulting engineers are the Benham Engineering Company, Oklahoma City, Okla.

The Blackwell Mill & Elevator Company, Blackwell, Okla., will expend about \$100,000 on increasing the equipment and capacity of its present plant.

A number of saw mills will be equipped in Clark and Lauderdale counties, Mississippi, by the E. E. Jackson Lumber Company, Baltimore, Md., which has acquired 50,000 acres of timber land.

The Gilmore-Puckett Company, Amory, Miss., L. E. Puckett manager, will equip a saw mill of 50,000 ft. of pine lumber daily.

The Lowndes Lumber Company is in the market for about \$2,500 worth of new sawmill equipment. S. G. Swain is manager.

Whitney & Williams, Baton Rouge, La., are reported in the market for veneer-manufacturing machinery, including one 62-in. rotary veneer lathe, clipper drag saw, knife grinder, trim saw, kiln, etc., for installation at Oscar, La.

The commissioners of the port of New Orleans, La., will receive bids until May 10 for the installation of a considerable number of steel lift bridges, with motors and mechanism complete, at the new cotton warehouses. E. M. Loeb, New Orleans Court Building, should be addressed.

San Francisco

SAN FRANCISCO, May 2, 1916.

Machine-tool deliveries appear to be easing up a little; but the demand is still running ahead of the supply. Second-hand tools are kept well cleaned up. Important Government business is now occupying the attention of the local trade. Substantial inquiries continue to come from the larger shops, and while single-tool purchases are the rule with the smaller shops, the aggregate is very satisfactory. The demand for other classes of machinery is increasing, as the lumber mills are getting under full headway, and the opening of many mines is bringing a large volume of business. The season for highway equipment is opening up well, and cannery, creamery and grain-handling machinery are seasonably active. Gas-engine manufacturers are exceptionally busy. In addition to the ships in their own yards, the larger shipbuilding concerns are building many marine engines for vessels under construction elsewhere, and several of the smaller boat shops are adding new equipment.

About 200 machinists in local automobile repair shops went on strike May 1, demanding a minimum wage of \$4.50 per day, an increase of 50c.

The San Francisco Bridge Company has taken the general construction contract for the new Union Iron Works drydock at Hunters Point.

The Shell Company, oil producer, is building wharves at its water frontage near Martinez, Cal., and is preparing to build a repair shop for its steamers.

The Southern Pacific Railroad is erecting a one-story building to replace the old boiler and tank shops at its Sacramento plant.

Berkeley, Cal., is having plans drawn for a municipal machine shop.

The Los Angeles Sanitary Can Mfg. Company, Los Angeles, has opened a machine shop.

The Pacific Coast Steel Company will shortly add a 75-ton trolley crane to its plant at South San Francisco.

The Richmond Machine & Boiler Works, Richmond, Cal., is putting in special machinery for the manufacture of range boilers.

The Thermo Boiler & Radiator Company, Oakland, is taking over the property of the Desy Utilities Company, and is preparing to manufacture boilers and heating apparatus in a large way.

A Mr. Fisher, Oatman, Ariz., is putting in a stock of mining machinery and supplies.

The Howard Company is putting up a new machine shop at First and Market streets, Oakland.

The Aero-Cushion Company, San José, Cal., has taken over the old Caton foundry at that place and is installing new machinery.

The Mammoth Copper Company, Kennett, Cal., is building a sawmill at its Stowell mine, and is preparing to build an aerial tramway.

The Pacific Northwest

SEATTLE, May 2, 1916.

Practically all mills in the Northwest report sufficient business on their books to keep plants operating for thirty or sixty days. The only handicap to the lumber situation now is the continued difficulties in the way of deliveries, and the possibility of the threatened railroad strike. The scarcity of ocean tonnage in the North Pacific waters has curtailed cargo delivery to a great extent, and if the strike materializes it is the opinion of millmen that most mills, after filling out their stocks, will be compelled to close. The log scarcity is still noticeable.

Machinery houses report an extremely busy spring, with orders ahead for months. Mining machinery continues unusually active, with little demand for second-hand equipment. Collections are improving.

The Oregon Power Company plans improvements to its plants in Springfield, and Dallas, Ore. The Springfield unit will be equipped to increase its capacity from 3500 kw. to 5000 kw. The Dallas plant will be equipped to increase its present capacity of 600 kw. to 2100 kw.

The U. S. Reclamation Service, North Yakima, Wash., has been notified that an appropriation of \$204,000 has been made for construction of a hydroelectric pumping plant near Grandview, Wash., to irrigate 4000 acres. The Grandview plant will generate 125 hp., and a plant near Mabton will generate 175 hp. The machinery of the two plants is estimated to cost \$109,000.

The port commission, Seattle, will install a 35-ton locomotive crane at the Smith Cove pier. The crane will cost \$16,000, and will have a 60-ft. boom.

The Canadian Pacific Railway is making arrangements to install a 50-ton electrically-operated derrick at its docks, Vancouver, B. C.

The Montana Flour Mills Company, Great Falls, has recently awarded contract for furnishing machinery and equipment for its new plant to the Nordyke-Marmon Company, Indianapolis, at an estimated cost of \$100,000.

The Electric Steel Foundry, Portland, Ore., has recently moved to its new and larger quarters at Twenty-fourth and York streets. On Feb. 4 last its old plant was destroyed by fire, and new structures, practically double the former capacity, were built in record time to care for its increasing business. It is equipped with an electric furnace. Leonard Schad is president.

A. Guthrie & Co., Portland, Ore., has contracted with the Cascade Lumber Company, Portland, for cutting 500,000,000 ft. in the Teanaway Valley, Wash. The work will require between ten and twelve years.

The Shevlin-Hixon Company, Bend, Ore., will immediately erect an addition to its lumber mill in Bend that will be in operation by Nov. 1 and will employ 250 men. The company's present plant cuts 300,000 ft. of pine per day.

The Chamber of Commerce, Palouse, Wash., announces that \$30,000 has been subscribed for the establishment of a packing plant. Spokane interests will handle the industry.

The Luther Mfg. Company, Walla Walla, Wash., has recently purchased a three-acre site in that city, on which it will erect a dehydrating plant, including a box factory.

The Quinalt Salmon Packing Company, Tacoma, Wash., has recently incorporated for \$75,000, with E. McMullen, J. D. Fletcher and J. K. Dorr, incorporators. It plans the construction of a salmon cannery which will have capacity of 30,000 cases a year.

The Perfect Cream Cooler Company, Arlington, Wash., has been incorporated for \$15,000 by H. D. Dunn, J. E. Wrage, William De Witt and M. H. Seymour to manufacture a cream cooler.

The Spokane-Edmonton Mining Company, Spokane, is being incorporated to take over the Alberta & Western Mines, Ltd., Edmonton, Alberta. It plans to build a power plant this summer costing \$75,000. W. B. McChesney, Spokane, is managing director.

The Kanite Explosive Company, Seattle, Wash., has recently purchased a 15-acre tract near Renton, Wash., on which it will erect a factory for the manufacture of explosives. The company is incorporated for \$100,000. O. Bergstrom is president, W. H. Blumenstein, vice-president, and Joseph Bjorn secretary and treasurer.

Canada

TORONTO, May 8, 1916.

According to an official statement issued from Ottawa, Ont., Canada's total trade during the fiscal year ending March 31, 1916, set a new record of \$1,309,511,866. War conditions increased Canada's export trade to the unprecedented figure of \$779,300,070, which is an excess of \$249,088,274 over imports. Compared with the preceding year's total, these figures showed an increase of \$450,617,455. Exports jumped from \$461,442,509 to \$779,300,070, and imports from \$497,451,902 to \$530,211,796. The year 1915 was a poorer trade year than either 1914 or 1913, although exports increased \$6,000,000 in 1915, total trade declined to \$958,894,411 over total trade for 1914, the then record of \$1,090,948,716. The present fiscal year shows an increase of \$218,563,150.

J. D. Lachapelle & Co., engineers, Montreal, are laying out and doing the purchasing of electrical equipment for the new plant which is being installed at Montmagny for the General Car & Machinery Company. The plant will cost \$1,000,000.

Electrically driven pumps will be installed in the water works plant at Niagara-on-the-Lake, Ont.

The Meaford Wheelbarrow Company, Ltd., Meaford, Ont., is in the market for a tinsmith's brake 6 ft. long, to bend 16-gage sheet iron.

The Renfrew Machinery Company, Renfrew, Ont., will have work commenced at once on the erection of a factory to cost \$8,000.

The Hamilton By-Products Coke Ovens, Ltd., will build a plant at a total cost of \$2,150,000. It will employ 300 men at the start.

The Provincial Legislature of Alberta has ratified the agreement between the Edmonton Power Company, care G. W. Farrell & Co., 43 St. Francois Xavier Street, Montreal, and the City Council, Edmonton, Alberta, for the supply of power for a period of 21 years. The project includes the construction of a large dam, powerhouses, etc., and will cost \$6,000,000.

The sawmill at Collingwood, Ont., owned by the J. T. Charlton Estate was totally destroyed by fire with a loss of about \$10,000, including much machinery.

The Elmira Planing Company is building a new mill at Elmira, Ont., to cost about \$25,000.

W. Duquette, Outremont, Que., has received a permit for the erection of a reinforced concrete, four-story garage to be constructed at the corner of Laurier Avenue and Durocher Street at a cost of \$50,000.

The Consolidated Felt Company, Berlin, Ont., is in the market for a hydraulic pump of 2000 lb. per sq. in. pressure for a 16-in. diameter cylinder press.

The St. Mary's Wood Specialty Company, St. Mary's, Ont., is in the market for a 16-in. buzz saw planer or joiner.

J. R. Baird, Mount Forest, Ont., is in the market for a No. 1 air compressor, complete with motor or gasoline engine for garage.

The Ontario Show Case Company, 456 Richmond Street West, Toronto, is in the market for a wood-turning lathe.

The Goldie & McCulloch Company, Ltd., Galt, Ont., manufacturer of boilers, condensers, etc., will commence at once the erection of an addition to its plant to cost \$100,000.

The Imperial Oil Company, Dominion Bank Building, Toronto, is looking for a site on Ashbridges Bay, Toronto, for a large refinery.

G. E. Harrison, manager of the Hydro-Electric Radiation Company, room 704, Traders Bank Building, Toronto, is contemplating the erection of a plant at Listowel, Ont.

The plant of the Dominion Harvester Company, Medicine Hat, Alberta, recently destroyed by fire, will be rebuilt. The company is making arrangements for construction work to start at once, and is in the market for machine tools and other equipment.

The dryhouse of the O'Brien Munitions, Ltd., Renfrew, Ont., which was completely destroyed by fire with a loss of \$40,000, will be rebuilt. L. Martin is manager.

Bowes, Jamieson, Ltd., Hamilton, Ont., is in the market for 18 or 20-in. turret lathes, also Bertram waving attachment for 4.5-in. shells with or without lathe.

R. S. & W. S. Lea, New Birks Building, Montreal, will receive tenders until May 20 for a pumping station and an oil engine-driven pump of 1,000,000 gal. per day capacity, to be installed at Charlottetown, P. E. I.

The Hamilton Bridge Works, Bay Street North, Hamilton, Ont., will build a steel and concrete addition to its plant at a cost of \$7,500.

S. W. Halliday, 20 Arlington Avenue, Montreal, will build a carriage factory on Catharine Street at a cost of \$6,000.

The Flint Varnish & Color Company, Perth Avenue, Toronto, is building a factory to cost \$150,000.

The Guelph Stove Foundry, Guelph, Ont., will commence work at once on the erection of a foundry.

The Stanley Steel Company, Hamilton, Ont., is building a large steel plant.

The Buffalo & Fort Erie Steamship Company, Ltd., Fort Erie, Ont., has been incorporated with a capital stock of \$100,000 by Alexander Fasken, Duncan McArthur, George H. Sedgewick, 36 Toronto Street, James O. Buckley, 11 Orchard Park Road and others of Toronto to build and operate steamships, etc.

R. H. Smart, Ltd., Brockville, Ont., has been incorporated with a capital stock of \$75,000 by Robert H. Smart, Daniel Derbyshire, William H. Comstock and others to manufacture hardware, electric goods, etc.

The Corrugated Paper Box Company, Ltd., Toronto, has been incorporated with a capital stock of \$200,000 by James H. Spence, 46 King Street West; William K. Fraser, Little York, Ont.; Grant Cooper, 79 Kendal Avenue; and others.

The Forte Poirier & Duchesneau Furniture Company, Ltd., Montreal, has been incorporated with a capital stock of \$45,000 by Romeo Poirier and A. Duchesneau of Montreal; Hormisdas Forte, Alfred Forte, Viauville, Que., and others, to manufacture furniture, desks, etc.

The White Sewing Machine Company of Canada, Ltd., Guelph, Ont., has been incorporated with a capital stock of \$500,000 by Charles L. Dunbar, Leo W. Goetz, John Sutherland and others. It will take over the Canadian business of the White Sewing Machine Company, Cleveland, Ohio, and will at a later date construct a plant to cost \$200,000.

Harry Tolton, Ltd., Berlin, Ont., has been incorporated with a capital stock of \$150,000 by Edwin F. Clement, William P. Clement, Ruby M. Fisher and others to manufacture machinery, tools, implements, etc.

The Canada Feather & Mattress Company, 41 Spruce Street, Toronto, Ont., is in the market for a 25-hp. alternating current electric motor.

The mills and elevators of the Rice Malting Company of Canada, St. Boniface, Winnipeg, Man., were totally destroyed by fire with a loss of \$300,000. R. Rice is president and general manager.

The plant of the Alberta Ornamental Iron Company, Ltd., at Redcliff, Alberta, Canada, is offered for sale by Basil Jones, liquidator. The plant is fully equipped. The main building is 46 x 125 ft., three stories; foundry, 46 x 112 ft. one story. Bids will be received up to June 1. The liquidator's address is in care of W. A. Henderson & Co., Medicine Hat, Alberta.

It is announced that a \$2,500,000 paper mill will be erected at Ocean Falls, B. C., by the Fleishacker & Johnson interests of California. The improvements at Ocean Falls have already cost \$3,000,000, promoted by a London company, and include a modern pulp mill and sawmill with capacity of 400,000 ft. of lumber daily.

Government Purchases

WASHINGTON, D. C., May 8, 1916.

Proposals will be received by the Bureau of Yards and Docks, Navy Department, Washington, until 11 a. m., May 20, for furnishing two shipbuilding cranes at the Navy Yard, Mare Island, from specifications supplied by the bureau or by the commandant at the yard.

The depot quartermaster, El Paso, Tex., will receive sealed proposals until 11 a. m., June 3, for installing an electrically operated pumping equipment at Fort Bliss, Tex.

The following proposals were received by the depot quartermaster, New York City, under schedule No. 834, opened April 18, for furnishing motor trucks, etc., to the quartermaster corps: Two 3-ton capacity machine shop trucks—Four-Wheel Drive Auto Company, \$3,400 each; f.o.b. Clintonville, Wis.; bodies f.o.b. Philadelphia; to be assembled at destination without extra charge; tools, extra, per list; all machine shop equipment, except electric generator set and motor with electric drill and grinder, the price of which is \$1,365; delivery 30 days; also except 13-in. lathe and 18-in. drill press, substituting 18-in. lathe with 96-in. bed, at \$1,000, and 20-in. drill press, belt-driven, at \$150; delivery in two days, \$1,057; power to be obtained from either clutch or winch shaft, dispensing with power equipment. The White Company, \$3,250; with top and work bench; no shop equipment; spare parts, \$1,778.46; immediate delivery, second truck company (27 trucks) in two days thereafter, third and fourth truck companies in two days and four days respectively. The Peerless Motor Car Company, \$4,900; f.o.b. Cleveland, within 30 days; subject to award of item one. The Packard Motor Car Company, \$6,710; f.o.b. Philadelphia, one

in 30 days, second in 35 days from order. The Morton W. Smith Company, \$3,150; f.o.b. New York City, deliver in 30 days; engine, etc., not quoted on, will furnish at cost in event of award. The Locomobile Company of America, \$7,150; f.o.b. Bridgeport, Conn.; Riker model.

Provision will be made at the terminal docks, Cristobal, Canal Zone; for the construction of an electric charging station to contain a repair shop.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, April 25, for supplies for the navy yards, as follows:

Schedule 9429, Steam Engineering.

Class One, f.o.b. works—One planing machine—Bid 33, \$38,250; 92, \$42,975.

Alternate—Same, Mare Island—Bid 33, \$43,830; 63, \$50,255.

Schedule 9457, Construction and Repair.

Class 11, Puget Sound—One electrically driven blower—Bid 1, \$860; 26, \$854; 43, \$1,187; 70, \$736.40; 76, \$1,075; 90, \$1,123 and \$1,187; 97, \$570.

Schedule 9493, Construction and Repair.

Class 163, Norfolk—One combination shear and punch machine—Bid 58, \$1,700 and \$1,685.

Bids were received also by the Bureau of Supplies and Accounts, Navy Department, Washington, May 2, for supplies to the navy yards, as follows:

Schedule 9447, Steam Engineering.

Class 2, Mare Island—One combination portable traveling head planing machine. Bid 85, \$21,825.

Alternate—Same, f.o.b. works—Bid 85, \$21,140.

Class 4, Mare Island—One crank shaft and steam turbine lathe—Bid 92, \$44,825.

Alternate—Same, f.o.b. works—Bid 92, \$40,100.

Schedule 9487, Construction and Repair.

Class 41, Brooklyn—One motor-driven plate-edge planing machine—Bid 12, \$21,000; 92, \$12,900; 119, \$16,140, \$15,300, and \$13,515.

Schedule 9509, Steam Engineering.

Class 51, Mare Island—One sand-mixing machine—Bid 27, \$783; 78, \$745.70; 86, \$575; 96, \$845.70; 121, \$745.70; 151, \$215 and \$280.

The names of the bidders and the numbers under which they are designated in the above lists, are as follows:

Bid 1, American Blower Company; 12, Bethlehem Steel Company; 26, Cutler-Hammer Mfg. Company; 27, Carroll Electric Company; 33, Detrick & Harvey Machine Company; 43, General Electric Company; 58, Manning, Maxwell & Moore; 70, Perine Machinery Company; 76, P. H. & F. M. Roots Company; 78, Manning, Maxwell & Moore; 85, Morton Mfg. Company; 86, Meese & Gottfried Company; 90, Universal Trading Company; 92, Niles-Bement-Pond Company; 96, J. W. Paxson Company; 97, Westinghouse Electric & Mfg. Company; 119, William Sellers & Co.; 121, Standard Sand & Machine Company; 151, Ellison E. Thornton.

Casing-head Gasoline

One operator in Oklahoma is producing more than 30,000 gal. of casing-head gasoline per day, while the total output of the mid-continent field is probably not less than 90,000 gal. per day, according to Paul Diserens, engineer of tests, Laidlaw-Dunn-Gordon Company, Cincinnati, who read a paper on the subject before a joint meeting on March 16 before the Cincinnati branch of the American Society of Mechanical Engineers and the Engineers' Club of Cincinnati. Three years ago, he said, the total production of casing-head gasoline in Oklahoma was 12,000 gal.

Casing-head gasoline is gasoline which passes off in the form of vapor with natural gas accompanying the flow of an oil well where oil and gas are found in the same field. The recoverable gasoline in the gas is worth often as much, Mr. Diserens says, as 20 per cent of the oil produced. The estimated loss of such gasoline in 1912 was not less than \$4,000,000. The practice in making the recovery is to compress the gas and then cool it to condense the gasoline. The plant requires a gas compressor with intercooler and after-cooler and a vacuum pump for stimulating the flow of the gas from the well.

The "factory fund" which Louisville, Ky., will raise will be limited to \$1,000,000, will be incorporated and administered as the Louisville Industrial Foundation. Subscriptions will be payable at the rate of 10 per cent each six months for five years.

NEW TRADE PUBLICATIONS

Electric Hand Lamp.—Hirsch Electric Mine Lamp Company, Philadelphia, Pa. Folder. Mentions an electric hand or cap lamp for use by watchmen, inspectors, mechanics and others requiring light under special conditions. Illustrations of the two types of lamps which derive their power from a small storage battery weighing 2 lb. are presented and the features that render it adaptable to any particular industry or class of labor are briefly touched upon.

Ball Bearings.—S. K. F. Ball Bearing Company, 50 Church Street, New York City. Brochure entitled "Ball Bearings as an Automobile Sales Factor." Illustrations and descriptive matter explain the advantages of using ball bearings in all classes of motor vehicles. After a few general questions and answers on the use of ball bearings, the work which the bearings have to perform is discussed in some detail together with the considerations that are most important in weighing the merits of different types of bearings. After this general introduction to the subject of ball bearings, the design of the company's bearings is discussed at some length, as well as their applications. In the latter part both line and halftone illustrations are used extensively to show the parts and the vehicles that are equipped. A glossary of engineering information completes the brochure.

Multi-Stage Centrifugal Pumps.—Goulds Mfg. Company, Seneca Falls, N. Y. Bulletin No. 120. Covers a line of multi-stage centrifugal pumps that are built in a wide range of sizes with vertically and horizontally split casings for various types of drive. After a general description of the pump, which is supplemented by engravings of individual parts, the different driving arrangements that can be supplied are shown, the engravings in some cases being views of actual installations. Illustrated lists of the parts of the pumps are presented, together with instructions on their installation and operation. Dimension tables are included.

Railroad Signal Wire.—Hazard Mfg. Company, Wilkes-Barre, Pa. Pamphlet. Describes a line of railroad signal wires and cables. After touching on the construction of the wire, the causes of internal ageing of insulation and the effect of external destructive agents are briefly touched upon. The advantages of insulation are discussed from an electrical point of view and information is presented on the insulation resistance and the service efficiency. Specifications covering the construction of the wire are included.

Lamp Cord Adjuster.—Hall Mfg. Company, 203 West Howard Street, Muncie, Ind. Circular. Calls attention to an adjuster for lamp cords by which it is possible to move the lamp to any point within a radius of 50 ft. from where it ordinarily hangs. The movement of the lamp can be stopped at any point and the lamp will stay fixed until it is desired to move it to another position. Among the uses for which the adjuster was particularly designed are around machinery in factories and in foundries and garages.

Expansion Joints.—E. R. Badger & Sons Company, 75 Pitts Street, Boston, Mass. Catalog. Presents illustrations and brief descriptions of a line of expansion joints for use in steam, air, water and other pipe lines. The advantages of the joints are briefly touched upon and suggestions on their installation are presented. Drilling tables for flanged valves and fittings are included.

Tool Steel.—Vanadium-Alloys Steel Company, Pittsburgh, Pa. Two folders. Relate to the Vasco non-shrinkable and choice tool steels. A brief description of the work for which these steels are recommended is given followed by directions for heat treating. The various extras are listed in both cases. The special advantage claimed for the first steel is that it is particularly adapted where it is necessary to eliminate shrinking and warping.

Roller Bearings.—American Roller Bearing Company, Pittsburgh, Pa. Bulletin No. 1003. Shows a number of different styles and sizes of roller bearings for a variety of uses. The bearings illustrated are of both the radial and thrust types. A brief description of the design and construction of the bearings is given, followed by short statements of their various advantages such as increased efficiency, longer life, greater load capacity, freedom from lubrication, adaptability for all speeds and adjustment for wear. A number of views of the bearings in service are presented and a partial list of machinery and equipment on which the bearings are used is given.

Copper Clad Wire.—Standard Underground Cable Company, Pittsburgh, Pa. Bulletin No. 202-1. Treats of a line of steel wire which is covered and protected throughout its length by a welded coating of copper, the two materials being united so thoroughly and effectively that it is possible to draw the product down to the smallest sizes in which

copper or steel wires are used. The uses of the wire in telephone and telegraph systems, electric light and power transmission lines, railroad and municipal signaling systems and for miscellaneous work are briefly touched upon, followed by a short description of the way in which the wire is made. Specifications for the wire are presented and a number of tables and diagrams comparing it with copper, steel and galvanized iron wires are included.

Gas and Air Meter.—Builders Iron Foundry, Providence, R. I. Bulletin No. 86. Size, 6 x 9 in.; pages, 52. Deals with a gas and air meter for station and industrial service. Its history, invention, principle of operation, methods of installing and advantages are briefly described. The bulletin is divided into two parts, one being given over to a discussion of the measurement of artificial gas, while the other relates to the measurement of high pressure gas, including natural gas. Illustrations of actual installations are given and the various types of instruments used are described. A list of standard Venturi meter tubes and measuring capacities is included.

Acetylene.—Searchlight Company, Karpen Building, Chicago, Ill. Circular. Refers to the difference between dry and wet acetylene for oxy-acetylene welding. The effect of the presence of a solvent in the acetylene on the efficiency of the welding flame is discussed, it being pointed out that a decrease of one-half to two-thirds in the efficiency as compared with dry acetylene is caused.

Electric Motors.—C & C Electric & Mfg. Company, Garwood, N. J. Bulletin No. 102-X. Describes a line of bi-polar motors with commutating poles that can be furnished in ratings up to 10 hp. The motors are built in open, semi-closed and totally inclosed types and are designed for direct connection to machine tools, fans and general industrial machinery.

Refractories.—Laclede-Christy Clay Products Company, Manchester and Sulphur avenues, St. Louis, Mo. Folder. Calls attention to the company's line of clays for refractories and the refractories themselves. Mention is made of some of the advantages of the company's clays and its experience in the manufacture of refractories.

Gaskets.—Akron Metallic Gasket Company, 150 North Union Street, Akron, Ohio. Mailing card. Devoted to a line of copper, gunmetal, lead and steel gaskets either with or without corrugations. In some cases asbestos is used in connection with the metal. Mention is made of the special gaskets which the company is prepared to supply for cylinder heads, valve bonnets, steam traps and separators, hydraulic machinery, etc., and the small stampings which it can make in copper and brass.

Grinding, Pulverizing and Separating Machinery.—Raymond Bros. Impact Pulverizer Company, 1315 North Branch Street, Chicago, Ill. Catalog No. 12. Illustrations and descriptive matter explain the operation of a line of grinding, pulverizing and air-separating machinery. The various machines are illustrated, and in some cases line engravings to show the construction are included. A number of views of actual installations and diagrams of typical ones are presented. A partial list of the substances that can be handled and another of the firms using this machinery are given.

Welding and Cutting Outfits.—Waterhouse Welding Company, Pelham Street, Boston, Mass. Catalog. Points out the advantages of using oxy-acetylene for welding and cutting metals. The different outfits that can be supplied are illustrated and briefly described and instructions for their use are included.

High-Speed Steel.—Vanadium-Alloys Steel Company, First Avenue and Ross Street, Pittsburgh, Pa. Folder. Describes the company's Red Cut Superior steel and points out the various uses to which it may put. In addition suggestions concerning the heat treatment of the steel are included, together with a list of the stock sizes of tool holder bits that can be supplied.

Coke and Coal Handling Systems.—R. H. Beaumont Company, Drexel Building, Philadelphia, Pa. Catalog No. 30. Illustrates and describes a line of machinery for handling and storing coke and coal in gas and by-product plants, particular emphasis being laid upon the machines which handle, crush and screen the coke. The precautions that must be observed in the design and operation of this machinery are briefly touched upon and a number of views of actual installations are presented. Mention is also made of an electric skip hoist, a line of cars and buckets and different types of screens.

Transmission Machinery.—A. & F. Brown Company, Elizabethport, N. J. Catalog No. 100. Size, 5 x 8 in.; pages, 129. Describes a line of transmission machinery and appliances comprising turned steel shafting, bearings of all kinds, friction clutches; flexible, insulated, compression and

flange couplings; pulleys and flywheels, gears, rope sheaves, etc. Illustrations of the various appliances are presented with tables of the sizes that can be supplied and a number of dimension diagrams and tables are included. Mention is made of the work which the company is prepared to do in the design and erection of complete transmission equipment, the building of special machinery, or the furnishing of grey iron and semi-steel castings.

Oil Filter.—Richardson-Phenix Company, Milwaukee, Wis. Bulletin No. 110. Describes a filter for circulating, filtering and sterilizing cutting oils and compounds which was illustrated in THE IRON AGE, Dec. 30, 1915. The construction and use of the system is gone into at some length, the text being supplemented by numerous line and halftone engravings.

Tool Holders.—National Forge & Tool Company, Erie, Pa. Catalog. Concerned with a line of tool holders which use a triangular cutter having twice the area and twice the depth of the square ones generally employed. Views of the different holders are presented with brief tables of the sizes in which they can be supplied. Mention is made of a line of adjustable clamping blocks and bolts and clamps for planing machines.

Wood Screw Machinery.—Asa S. Cook Company, 603 Franklin Avenue, Hartford, Conn. Catalog. Presents illustrations and brief descriptions of a line of wood screw machinery that includes slotting, threading, shaving and pointing machines. As a rule two pages are given to each machine, the description being presented on one with an engraving and condensed table of specifications on the facing one. Mention is also made of a line of open and solid die rivet machines and one for grinding the shaving and slotting tools. The equipment that can be furnished for wood screw plants is touched upon with a list of the operations in the order in which they are performed and data on the amount of labor required.

Corrosion Resisting Paint.—Harrison Bros. & Co., Inc., Philadelphia, Pa. Pamphlet entitled "Fighting the Flameless Fire." Pertains to a rust resisting paint known as Antoxide. A brief account of the development of this paint is given and mention is made of the work that has been done by various technical societies in the determination of the relative values of pigments in resisting rust formation on metal surfaces.

Steel Barrels.—Whitaker-Glessner Company, Wheeling, W. Va. Catalog B. Mentions a line of steel barrels that are made in sizes ranging from 15 to 110 gal. in various styles and coatings. Details of construction are given, followed by the specification of the Interstate Commerce Commission for iron or steel barrels or drums for inflammable liquids or acids. The barrels are furnished with or without chime hoops in black, painted or galvanized finishes and are reinforced by separate rolling hoops. The various styles of barrels are illustrated with brief specification tables. Among the substances which the barrels are designed to contain are varnish, ink, acids, chemicals, etc.

Roller Bearings.—American Roller Bearing Company, Pittsburgh, Pa. Bulletin No. 1003. Covers a line of roller bearings that are made for all purposes. The design and construction of the bearings is gone into at some length, the text being supplemented by a number of engravings. Following this various features, such as increased efficiency, longer life, greater load capacity, elimination of lubrication, etc., are briefly touched upon. The different classes of work for which these bearings are used are next taken up and briefly described, the text being supplemented by numerous engravings. Among the applications mentioned are steel mill equipment, tractor service, general machinery and equipment, trucks and transportation devices and power transmission equipment.

Motor Trucks.—Locomobile Company of America, Bridgeport, Conn. Catalog. Relates to the Riker worm-drive motor truck. The various features of construction are gone into at some length, a separate page being given to each with a photograph at the top having the different points marked and side heads to call particular attention to them. Following this a list of body designs is given arranged by the names of the bodies and another one containing the various trades or materials with a list of the numbers of bodies that are best suited to each. Illustrations of the bodies are presented with brief descriptions. A number of views of the trucks in actual service and a partial list of users are included.

Boiler Grates.—Washburn & Granger, 50 Church Street, New York City. Catalog No. 7. Relates to a line of dumping, shaking and stationary grates for boilers. The catalog is divided into three sections, each dealing with one of the types of grate. In each, engravings of the different forms of grates in that particular class are presented with illustrations of the various parts of the grates and diagrams with the several parts numbered. Mention is also made of a line of cast-iron and steel fronts for tubular boilers that can be supplied.

